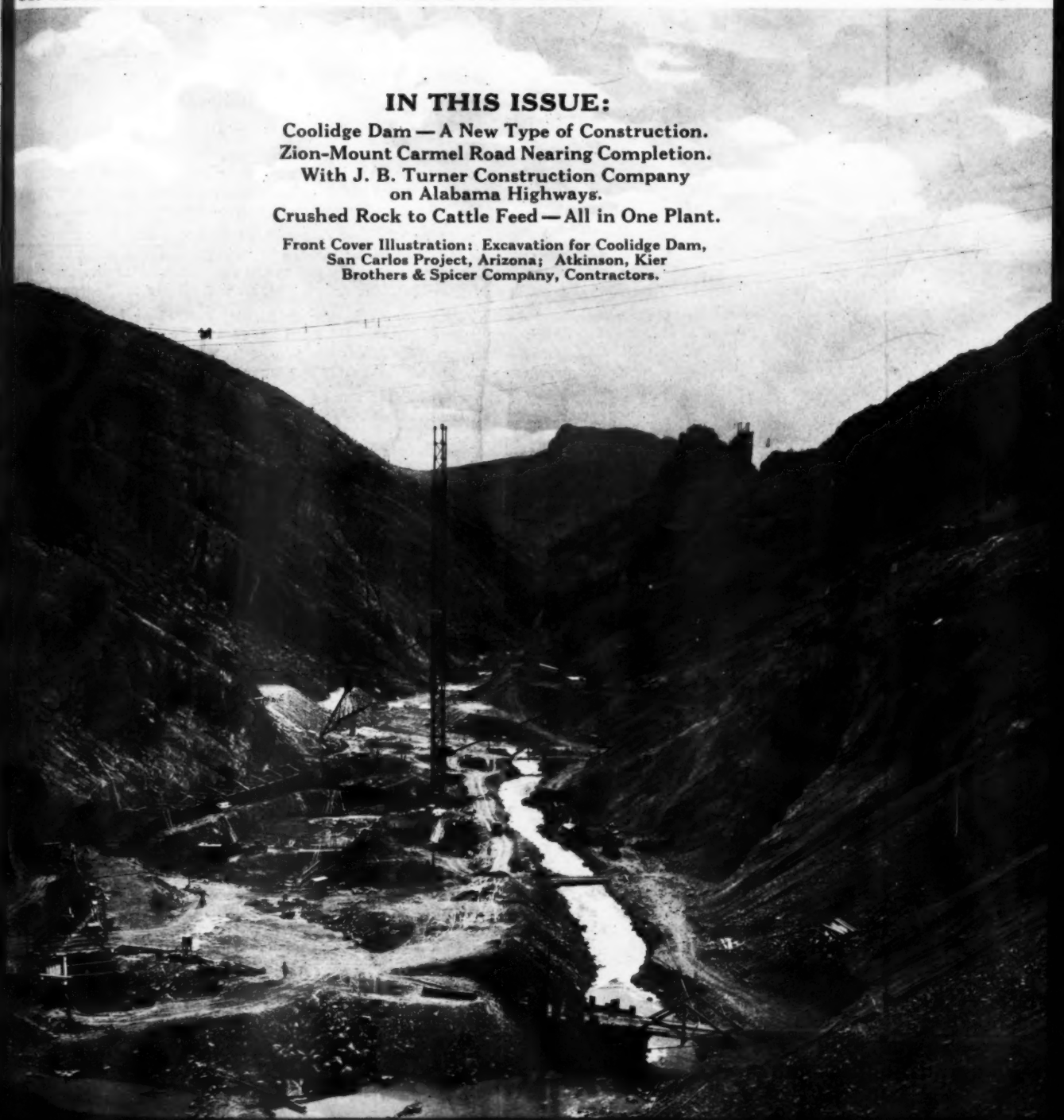
The EXCAVATING ENGINEER

Vol. XXII AUGUST 1928 No. 8

IN THIS ISSUE:

Coolidge Dam — A New Type of Construction.
Zion-Mount Carmel Road Nearing Completion.
With J. B. Turner Construction Company on Alabama Highways.
Crushed Rock to Cattle Feed — All in One Plant.

Front Cover Illustration: Excavation for Coolidge Dam, San Carlos Project, Arizona; Atkinson, Kier Brothers & Spicer Company, Contractors.



UMI

Again—larger profits on the big job by using a big machine

750,000 yards to dig out—a cut three-quarters of a mile long, 250 feet wide and 46 feet deep. The approach to Cleveland's new passenger terminal.

And the H. E. Culbertson Company, of Cleveland, Ohio, went into this man's size cut with *a man's size machine*, a 3½-yard BUCYRUS-ERIE Dragline.

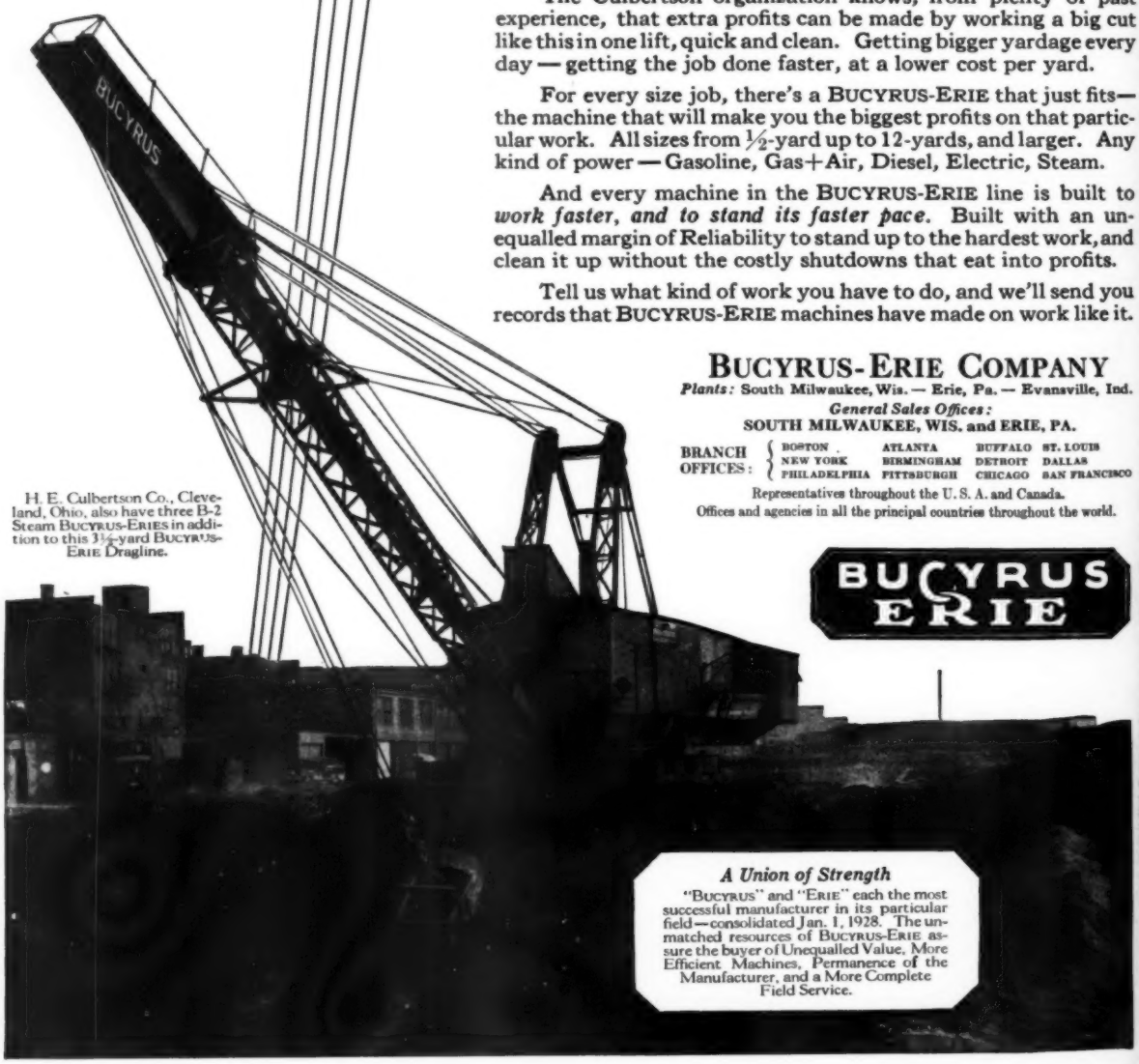
When you have big yardages to move, it pays to "plant" the job to suit

The Culbertson organization knows, from plenty of past experience, that extra profits can be made by working a big cut like this in one lift, quick and clean. Getting bigger yardage every day — getting the job done faster, at a lower cost per yard.

For every size job, there's a BUCYRUS-ERIE that just fits—the machine that will make you the biggest profits on that particular work. All sizes from ½-yard up to 12-yards, and larger. Any kind of power — Gasoline, Gas+Air, Diesel, Electric, Steam.

And every machine in the BUCYRUS-ERIE line is built to *work faster, and to stand its faster pace.* Built with an unequalled margin of Reliability to stand up to the hardest work, and clean it up without the costly shutdowns that eat into profits.

Tell us what kind of work you have to do, and we'll send you records that BUCYRUS-ERIE machines have made on work like it.



H. E. Culbertson Co., Cleveland, Ohio, also have three B-2 Steam BUCYRUS-ERIES in addition to this 3½-yard BUCYRUS-ERIE Dragline.

BUCYRUS-ERIE COMPANY

Plants: South Milwaukee, Wis. — Erie, Pa. — Evansville, Ind.

General Sales Offices:
SOUTH MILWAUKEE, WIS. and ERIE, PA.

BRANCH OFFICES:

BOSTON	ATLANTA	BUFFALO	ST. LOUIS
NEW YORK	BIRMINGHAM	DETROIT	DALLAS
PHILADELPHIA	PITTSBURGH	CHICAGO	SAN FRANCISCO

Representatives throughout the U. S. A. and Canada.
Offices and agencies in all the principal countries throughout the world.

BUCYRUS ERIE

A Union of Strength

"BUCYRUS" and "ERIE" each the most successful manufacturer in its particular field—consolidated Jan. 1, 1928. The unmatched resources of BUCYRUS-ERIE assure the buyer of Unequalled Value, More Efficient Machines, Permanence of the Manufacturer, and a More Complete Field Service.

HERCOMITES 2 TO 7

THE GREATEST EXPLOSIVES VALUE OFFERED TODAY OFTEN SAVING UP TO 30% IN EXPLOSIVES COSTS

LOWEST COST PER CARTRIDGE

SAFEST COMMERCIAL EXPLOSIVE KNOWN TO INDUSTRY—GIVES A MINIMUM OF NOXIOUS FUMES

HERCOMITES **are successfully replacing Gelatin Extras and Extra L. F. Dynamites of from 20% to 50% strength at a substantial saving. The table shows the grades of Extras and Gelatins that the new *Hercomites* should replace cartridge for cartridge.**

HERCOMITE 2 is nearest grade to	60% Extra L. F. or 40% to 50% Gelatins
HERCOMITE 3 is nearest grade to	50% Extra L. F. or 30% to 35% Gelatins
HERCOMITE 4 is nearest grade to	40% Extra L. F. or 25% to 30% Gelatins
HERCOMITE 5 is nearest grade to	30% Extra L. F.
HERCOMITE 6 is nearest grade to	25% Extra L. F.
HERCOMITE 7 is nearest grade to	20% Extra L. F.

Write for descriptive booklet.

HERCULES POWDER COMPANY

(INCORPORATED)

Sales Offices: **Allentown, Pa., Birmingham, Buffalo, Chattanooga, Chicago, Denver, Duluth, Hazleton, Pa., Huntington, W. Va., Joplin, Mo., Los Angeles, Louisville, New York City, Norristown, Pa., Pittsburg, Kan., Pittsburgh, Pottsville, Pa., St. Louis, Salt Lake City, San Francisco, Wilkes-Barre, Wilmington, Del.**

Hercules Powder Company, Inc.,
949 King Street, Wilmington, Delaware

Please send me additional information regarding the new Hercomites, 2 to 7.

Name _____

Company _____

Street _____ **City** _____ **State** _____

Pouring the Foundations, Tieing the Dam to Solid Bed Rock.

Two Shovels and Two Draglines Making the Dirt Fly in Excavation for Foundations.

The EXCAVATING ENGINEER

Vol. XXII AUGUST 1928 No. 8

Coolidge Dam—A New Type of Construction

By E. SICKLER

Atkinson, Kier Bros. & Spicer Company Handles 300,000 Cubic Yards of Excavation, and Placing 190,000 Cubic Yards of Concrete with 3,000 Tons of Reinforcing Steel

THE Coolidge Dam, now under construction at San Carlos, Arizona, has been attracting much attention in the engineering world, for a number of reasons. It is the latest example of an irrigation project built by the United States, and is interesting especially to friends of the Indians, since one-half the water impounded is to go to the Pima Indians. It is of particular interest to engineers, because the type of dam called by its originator, Major C. R. Olberg, a Multiple Dome Dam, is new.

Additional Strength in Dome Type of Construction

The Multiple Dome Dam consists of three egg-shaped domes supported by the canyon walls, and by intermediate buttresses, with the smaller end of the egg resting on the foundation and the larger end forming part of the crest of the dam, and serving as a support for the bridge which will form a part of the transcontinental highway. The well-known strength of the egg-shell foundation naturally adds greatly to the strength of the structure, but owing to the limitation of available methods of analysis, its beneficial effect has not been included in the calculations. Each dome was figured as a series of inclined arch elements, and the unquestioned strength of the dome itself remains merely as an additional factor of safety.

Long Chutes from the Tower Carry the Concrete to Place. Notice the Shovel Building Road at the Upper Right.

The Coolidge Dam is being built on the Gila River, some ten miles below its confluence with the San Carlos, at the head of a box canyon on the San Carlos Indian Reservation. The project to be served by water from the dam consists of 100,000 acres, part of which lies on the Pima Indian Reservation and the remainder in the adjacent Florence-Casa Grande Valley.

The dam is being built by the United States Indian Irrigation Service, under authority of the San Carlos Bill, passed by Congress in 1924.

Crew of the 50-B Pose for Their Picture while Waiting for the Plymouth to Spot the Westerns.

Funds were made available in 1925; work on design at once proceeded, and the contract for construction was let late in 1926 to Atkinson, Kier Bros. & Spicer Company, contractors, of Los Angeles, who submitted the lowest bid, which was $2,268,525.50.

Before the contract for the dam was let, the United States Indian Irrigation Service constructed approximately ten miles of highway, leading from the railroad station at San Carlos, to the dam site. Most of this road was over ordinary

desert country, but the last two miles or so, including service roads around the dam, were heavy rock excavation.

A water supply from mountain springs to furnish approximately 500 people with domestic water, was developed. Water for construction purposes is pumped from a spring of warm mineral water below the dam site. Camp site was located and temporary buildings, office and bunk house were erected with most of the conveniences of a modern city.

A 44,000-volt steel tower transmission line was constructed across twenty miles of rough mountainous country, to Hayden, Arizona, where power for construction purposes is purchased from the Nevada Copper Company. It is intended later to use this line for the distribution of power from the power plant to be constructed in connection with the dam. The line was surveyed and designed by government engineers, and built under contract by Bert L. Perry, Incorporated, of Los Angeles.

Drills Holes Up to 100 Feet Deep

Work was begun on the west spillway on January 4, 1927. The excavation of the spillways involved the removal of 300,000 cubic yards of rock; quartzite, sandstone, and some limestone. Cochise jackhammers were used for drilling, air being furnished by an Ingersoll-Rand-Imperial compound compressor. An Armstrong well rig was used for drilling the deepest holes, some of which were 100 feet in depth and 6 inches in diameter.

Removal of the rock was accomplished by means of one Bucyrus 20-B and two 700 P. & H. shovels, together with one one-yard Link-Belt excavator. As occasion demanded, the work was split between the draglines and shovels. White, G. M. C., and Mack dump trucks were used to convey the spoil to a convenient point upstream from the dam. The same equipment, with the exception of the Armstrong drill, was used for river bottom excavation, for foundation.

Bed rock, which occurred at a maximum depth of 24 feet below river bed, was dressed up scrupulously clean, explored, drilled for grouting and anchor rods, by means of X-72 Ingersoll-Rand-Leyner drills. The powder used for blasting was 40% Hercules dynamite, full gelatine.

Pumps Hang from Aerial Cableway

Unwatering of the foundation pit was done by driving two sumps at the lowest point of bed rock, one located near the upstream, and one near the downstream, limits of the pit. A 12-inch Byron-Jackson turbine pump supported from an aerial cable was located in each sump, discharging into the diversion flume.

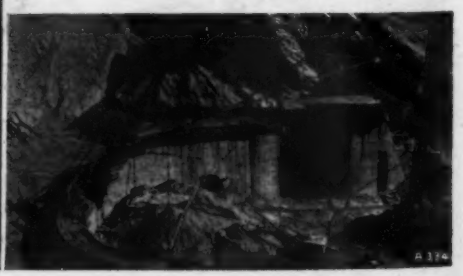
In order to carry on this excavation, it was necessary to confine the river to its normal channel, which was near the west wall of the canyon. This channel was straightened in order to carry the greatest amount of water for its cross section. In a period when the hydrographic chart showed that a channel thus prepared would hold all the water, the east side of the river bed was opened up, starting at the downstream end, and working up, the spoil being hauled upstream to form a permanent diversion channel through the easterly dome of the dam.

Just Coming Out after a Nice Swim.

As the most pressing problem was to get the work well up and out of danger from possible floods in the river bed, the foundation of the east buttress was brought to an elevation well above the old river bed, and the water was then diverted from the original channel into the flume just mentioned.

Looking Northeast from West Spillway.

Looking East from West Spillway.



First Pouring Under Way November 26, 1927.

Diesel Dragline in Gravel Pit Supplying Aggregate.

As soon as the river was permanently diverted, the east side of the canyon was opened. Excavation operations were carried on from the by-pass channel to the toe of the west buttress. The spoil was divided between the upstream cofferdam and the back water or tail cofferdam downstream.

Gravel Pit Excavated by Bucyrus Diesel Dragline

The location of the gravel pit is about one-half mile south of the dam, in the bed of the river. The pit is very uneven, as the sand and rock are much mixed together, with sand, small rock and pea

Bed Rock Under the East Buttress.

gravel perhaps in one place, and boulders and dirt in another.

A Bucyrus 50-B Diesel dragline loads the trains of four-yard Western side dump cars, which are hauled in trains of four cars each, pulled by three eight-ton Plymouth gas-engine locomotives. The machines from the foundation excavation are also utilized here in loading aggregate as they can be spared, when they can facilitate the sorting and loading of the aggregate.

At the time this article is written we are advised by Mr. Tripp, general superintendent, that most recent figures on fuel cost for the 50-B Bucyrus Diesel show the cost of fuel, oil and grease at $2.12 per 8-hour shift.

Crushing, Screening and Washing Plant Prepares Aggregate for Stock Piles

The gravel plant itself consists of standard crushing and screening equipment. An Allis-Chalmers 21-inch by 36-inch jaw crusher, one 7½ Allis-Chalmers Gyratory crusher, and one No. 5 Allis-Chalmers Gyratory crusher are used. The pit run material is first put through grizzlies, eliminating the extra large rock, the balance going through a jaw crusher to a belt conveyor, which discharges into the screening and washing plant. This material is screened in four sizes: sand, pea gravel, ¾ to 2½-inch and 3 to 8-inch rock. The screens are 42 inches by 23 feet over all.

The screened material then passes into bins beneath, and oversize is chuted through the No. 7½ and No. 5 Gyratory crushers, while the fines are deposited below, into conical screens. The pea gravel and sand are separated, and the sand goes into two conical launder washers, where it is cleaned and washed free of silt and other deleterious material.

Four sizes of belt conveyor takes the material from the bins to the stock piles. The stock piles are located over a tunnel from which the proper sizes are drawn off and conveyed by a belt conveyor

(Continued on Page 307)

Zion-Mount Carmel Road Nearing Completion

Nevada Contracting Company Drive Tunnels Through Mountain Rock

Looking Through One of the Rock Tunnels Showing the Material Through Which the Road Is Being Built.

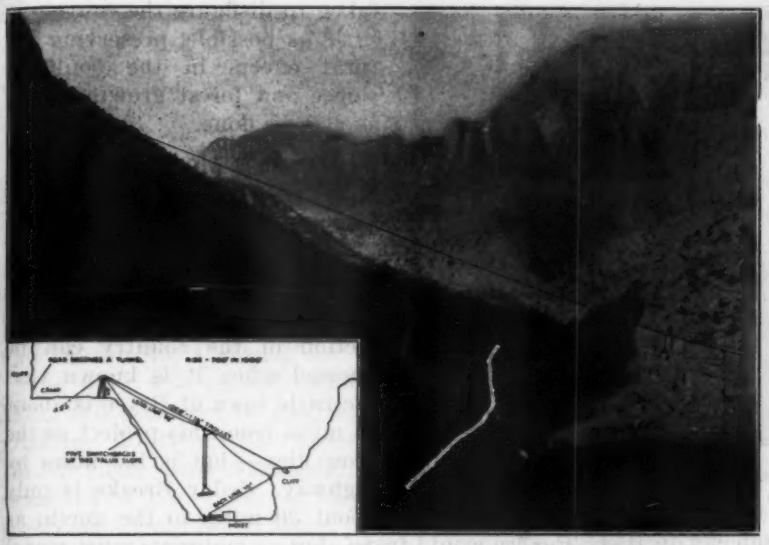
TO make a rise of 3,000 feet in elevation up the sides of a mountain which, for the larger part of the 3,000 feet stands at an angle of 90 degrees to the horizontal, is a real problem.

Such a problem is being solved now in Zion National Park, where the Zion-Mount Carmel road undertakes to do that little thing. The Nevada Contracting Company is using more than 250 men in the work, and right now are "driving hole" (for a goodly portion of the road is a tunnel) at the rate of 900 feet a month. This tunnel driven through sheer rock is 22 feet by 14 feet in dimensions, with six gallery portals scattered along the way, which affords stopping places where the automobilist may draw aside from the traffic and view the stupendous scenery. Some of these galleries are 75 feet or more in length, and the arch of their portals are 35 feet high. And there are few places in the United States where the scenery is more impressive and where mere man is dwarfed into insignificance more effectively than from these giant portals that look out across the mammoth canyon some two or three thousand feet above the little Pine Creek which hurries anxiously along the canyon bed.

Over a Mile of Tunnel

The roadway tunnel itself is a trifle more than one mile in length, and comprises Section No. 2 of the Zion-Mount Carmel Road. Section No. 1 is also under contract to the Nevada Contracting Company, and is about four miles long, and most of this length is spent in "making elevation."

Some idea of where Section No. 2 begins and leaves off, and where Section No. 1 starts, is perhaps better illustrated than described. We refer, therefore, to the accompanying photographic reproduction and line drawing, the latter of which



Along This Talus Slope the Zion-Mount Carmel Road Switch-Backs Its Way to the Foot of the Cliff, Where It Becomes a Tunnel. Note the Aerial Cableway Stretched Across the Canyon. The Line Drawing Shows the Arrangement of This Aerial Tram.

was furnished by the superintendent on the job. In the photograph may be seen the temporary camp, down in the depths of the canyon, — the talus slope up which the road being built switch-backs, becoming unavailing, with the result that the road necessarily becomes a tunnel. It being unnecessary to bore through the bowels of the cliff, the road follows its face, and so it is that for light and ventilation, for the purpose of giving the workmen all out-doors in which to dump their yardage, and also to provide motorists with an opportunity to view the unparalleled scenery, portals have been broken out of the sides and galleries provided.

Parts of the tunnel, which is sixteen feet high, are through solid rock, which requires no timbering, while other sections are being timbered as the drills and shovels eat into the mountain. The maximum grade on the project is 6 per cent. This grade is used in a few places where the alignment is good. All other grades are 5 per cent or less. The grade in the tunnel is 5 per cent.

Aerial Cableway Carries Machinery

All the necessary machinery, such as drills, compressors, transformers, shovels, etc., necessarily had to be transported to the job through the canyon itself and landed at the foot of the talus slope. These, then, were hoisted to the foot of the cliff by means of a 1,000-foot aerial cableway — a 700-foot rise in 1,000 feet. The wire rope employed here was the American Cable Company's Tru-Lay rope, the sizes being given in the line drawing. A 40-foot tower was erected at the top of the slope to permit the cableway to operate and to land the machinery properly.

Up this steep tramway, swinging from a trolley, went castings and machinery parts up to 3,000 pounds in weight. The hoist located at the bottom of the canyon used a 5/8-inch lead line while the thousand-foot trolley cable was of 1⅛-inch size. The back line was of ½-inch cable. Sufficient landing room was available at the top to permit setting up the equipment ready for use. And here also was located one of the camps.

Compressed Air Tunnel Shovels "Drive Hole"

To dig the tunnel along the face of the cliff it was necessary to erect scaffolding — in some cases from the top of the talus slope, in others suspended from the top of the cliff. From this scaffolding the several portals or gallery openings were broken out by hand, until the holes became large enough to permit the employment of Bucyrus-Erie tunnel mucker and Butler mine shovels, these being operated by compressed air. The compressors for this work were furnished by the Sullivan Machinery Company, the electric power being transmitted by a specially built line 20 miles long.

Short Underground Cuts on Section No. 3

Section No. 3 of the Park Service's end of the highway extends from the east end of the present

Bucyrus-Erie Type-A Tunnel Mucker Loads a Mack Truck.

contract of the Nevada Contracting Company three and one-half miles to the east boundary of Zion National Park. This section lies in the winding canyons of Upper Pine Creek and Clear Creek.

Galleries of the Zion-Mount Carmel Road Look Out Upon Such Stupendous Scenery as This.

In order to secure satisfactory alignment on this section of the project it will be necessary in several places to cut through ridges with short tunnels, the longest of which is 600 feet in length. Other tunnels are from 100 to 300 feet long. These tunnels are all on a tangent, so that lighting will be unnecessary for the tunnels on Section No. 3.

Since the elevation reached by Section No. 2 is above the arch, heavy grades are not necessary on Section No. 3. The grade is rolling, taking advantage of the most favorable points in the canyon to secure satisfactory alignment and as economical construction as possible. This section is classified as 100 per cent solid rock.

Because the sandstone through which the park end of the Zion-Mt. Carmel Highway is being constructed has poor wearing qualities when exposed to wear from traffic, it will be necessary to surface the entire project within the park before it can be used. The surfacing material for Sections Nos. 1 and 2 will be obtained from the gravel bars in the bed of Zion Creek, and surfacing material for Section No. 3 will be obtained from deposits of limestone east of the park boundary.

There will be four bridges, ranging in length from 60 to 200 feet, on the park service's portion of the highway. Two of these bridges near the checking station will be concrete arches, faced with sandstone masonry. The other two bridges probably will be of concrete or masonry arches, and masonry arches will be used for several smaller structures, ranging from 12 to 16 feet in span.

Four Bridges Necessary on Portion of Highway

Guard rails and retaining walls on the project will be of sandstone masonry. Every effort is being made to have the work harmonize with the natural scenery, so that the road may blend with and form a part of the landscape. Care is being taken to disfigure the canyon as little as possible, preserving natural effects in the boulders, slopes and forest growth so far as may be done.

New Road Brings Grand Canyon 40 Miles Closer

The road, when completed, will very materially shorten the present highway distances. Something of the ruggedness of this section of the country can be guessed when it is known that the little town of Bryce is about 54 miles from this project as the crow flies — but is 159 miles by highway. Cedar Breaks is only about 30 miles to the north, as the bee would travel, but as motorists must travel it is 140 miles distant. This new cut-off, which scales the 90-degree side of the canyon, reduces the 159 miles to Bryce to 88 miles and to only 70 miles to Cedar Breaks. Because of this new road the Grand Canyon, which lies to the south (now about 142 miles by road) will be brought closer by nearly 40 miles.

Digging Into One of the Entrance Ways.

Why?

First Working Girl: "I've been on this new job for five months and the boss has never got fresh with me once."

Second Working Girl: "My Gawd! Why don't you quit?" — *The Staley Journal.*

With J. B. Turner Construction Company on Alabama Highways

Eight Miles, Decatur to Tuscumbia, Recently Completed

THROUGH level country dotted with ponds and lagoons and wooded with old orange hedging, J. B. Turner Construction Company completed on April 1st eight miles of highway between Decatur and Tuscumbia, Alabama.

The work was started October 1, 1927, and consisted of clearing and grading, involving the moving of 151,000 cubic yards of material. This consisted of loose rock, red clay and surfacing of old waterbound macadam which had to be removed from a previous road grade. The latter material was picked up with shovels and hauled out for wasting or put into the deep fills.

J. B. Turner, at the Right, Looks Over the Job with E. P. Niven, Superintendent, Later Transfered to the Tuscaloosa Job.

Records of 1000 and 900 Yards Set by Shovel Operators

Excavation was handled with two caterpillar-mounted steam shovels, a Bucyrus 20-B, J. L. Roberts, operator, and a Bucyrus 31-B, W. C. Gilland, operator. The 31-B was transferred on January 1st to a gravel job in Tuscaloosa County, between Bessemer and Tuscaloosa, Alabama, as the work was well

On the 31-B Running Board We Find Left to Right: Horace Coheley, Fireman; W. C. Gilland, Operator; "Firey," and the old reliable negro "Moon," Night Watchman.

ahead of schedule. Production averaged 800 yards per 10-hour shift for the 31-B and 750 yards for the 20-B, with records of 1000 yards for the one-yard shovel and 900 yards for the three-fourths-yard machine. Cuts were mostly light, the greater part being widening old road and side borrow with no casting permitted. Fills were four to five feet.

Hauling was handled by teams and trucks, the average haul running around 1000 feet. Six Eagle 1½-yard dump wagons and eight Russells were used besides five 2½-yard Mack trucks. Sixty mules and horses were employed on the job, part of these handling a wheeler gang for light finishing of grade and for regular blade machines. Two Super Mogul Russells were used for blading and two Best caterpillar-mounted tractors.

The road was built with a 26-foot crown, 4½-foot ditches in cuts, with many borrow ditches draining ponds 12 foot by 12 foot in cross section and up to one-half mile in length. In construction of these ditches a five-foot berm between ditch and fill was required.

Caterpillar Mounting Handy for Clearing

The right-of-way was cleared to a width of 80 feet, and this work was handled entirely by shovel. The old orange hedging had very heavy roots and was piled up with stumps to a height of 10 feet on either side of the borrow pits. Caterpillar traction made this clearing operation practical shovel work. In talking of their mobility Mr. Turner mentions that he has moved his shovels 12 miles per day without damage to the machines.

J. L. Roberts, Operator, Will Coheley, Fireman, and the 20-B.

The cats were also of great advantage in moving from cut to cut and in shifting their activities in order to work at best advantage. With the cater-

pillar mountings any part of the job could be handled at any time with but very little delay or inconvenience.

The Bucyrus 31-B Doing Her Stuff.

143,608 Cubic Yards in 80 Shifts on Turner Job

C. M. Gardner is general manager for J. B. Turner and T. S. Burnum is the superintendent in charge of this work. The J. B. Turner Construction Company was organized in 1920, and has achieved an enviable reputation in Alabama and Tennessee as dirt movers. On highway job S-349-A for McNairy County, Tennessee, they moved 143,608 cubic yards of excavation and borrow, and completed the job with their Bucyrus shovels in 80 working days. With the same machines they also handled Barbour County, Alabama, job No. FAP 168, of 116,000 cubic yards and Cullman County, Alabama, job Sur. 51 of 150,000 cubic yards.

Crushed Rock to Cattle Feed—All in One Plant

The Waukesha Lime & Stone Company Produces Many Bi-Products, Some of Which, At Times, Assume Greater Importance Than the Crushed Rock and Gravel

Bird's-eye View of the Operations of the Waukesha Lime & Stone Company. This Picture Was Taken Last Fall After the Loading Operations Were Tied Up for the Season. The 80-B Is Being Overhauled at the Left of the Gravel Plant in the Upper Center. Stripping Operations Are Well Illustrated and the Island of Cemented Gravel Is Shown Protruding into the Center of the Gravel Pit.

AS you drive away from the modern plant of the Waukesha Lime & Stone Company, after an inspection which has gone carefully into the details of operation, one impression stands out above all the rest. That impression is summed up in Vice-President Wolf's statement: "Get the best equipment and the best men and then take care of them to the best of your ability."

This is simple psychology but no truer exists. Take a man with some self-respect, give him a good place to work and tools — not only good but good looking — and you are bound to get the most out of the man.

In the early spring just before the season's operations are about to begin you will find the equipment at the Waukesha Lime & Stone Company — from steam shovel to loading bins — mechanically ready, painted and ship-shape in every sense of the word. The dump cars, standing on the rail ready to begin their endless trips, look brand new in their fresh coat of paint; the locomotives have been tuned up for the season's run and also look fresh from the factory. Farther down in the pit stands the 2½-yard shovel, and only the eye of an expert could tell that it had not just been moved in; only the wear on the dipper front — a veteran of over a million tons — marks the machine as having worked before.

Of course, this very thorough overhauling that has been given to every piece of equipment on the property was not done without considerable expense. Many a long winter hour was put in by the employees in getting everything ship-shape.

If you ask "Why bother with the paint, isn't the overhauling enough?" Mr. Wolff has a ready comeback, "Did you ever notice how much better you feel in a good suit of clothes and a pair of new shoes? Did you ever notice how you stick your chest out a little bit more and feel just a little more important? Ten dollars worth of paint and the time needed to put it on not only preserves the steel or wood but has an effect on the man worth many times the cost."

F. C. Wolff, Vice-President in Charge of Operations of the Waukesha Lime & Stone Company Tells B. F. Johnson How They Make Things Hum at Waukesha.

All Sizes of Limestone Aggregate

The Waukesha plant is unusual in that it is practically the only one in this section of the country which has extensive operations in gravel and limestone deposits centralized in one location, producing limestone aggregate in all its different phases.

The company was formed in March 1905 by the late John O'Laughlin. After Mr. O'Laughlin's death in 1913 the property was operated by his estate, and early in 1927 the entire stock was purchased by four of its oldest employees, its present officers, H. M. Halverson, president; F. C. Wolf, vice-president in charge of operations; M. K. Wilson, vice-president in charge of sales; and E. F. Bremer, secretary and treasurer.

Three-Quarter Million Tons of Gravel and 200,000 Tons of Stone Yearly

The property of the Waukesha Lime & Stone Company covers an area of approximately three-quarters of a square mile, through which run the Little Fox River and the main line of the Minneapolis, St. Paul and Sault Ste. Marie Railroad. In operation on this property today is a gravel plant capable of an output of about 750,000 tons per year, a limestone quarry with a capacity of 200,000 tons per year with the present equipment, and a bi-products plant.

This Is the Way the Pit of the Waukesha Lime & Stone Company Looked Fifteen Years Ago. Notice the Ancient Vulcan on Traction Wheels in the Center Foreground.

Gravel Pit Face Gives a Year's Production from Single Cut

On the east side of the river lies the gravel plant. The pit face which runs about 100 feet high is now a slightly curved line about three-quarters of a mile long. Recently it was divided in two by a promontory of cemented gravel, standing in the air like a concrete wall. For 100 feet back of the point, this promontory consisted of what can best be described as a natural concrete. The receding face on either side of this finally brought the loading operation to the point where the promontory could be cut through, and the two parts of the face joined together, leaving a single face which will, with one cut of the shovel, produce approximately 750,000 tons a year.

Two-Yard Steam Shovel in the Gravel Pit.

The material is large size gravel that stands vertical, and which, like any such deposit, is subject to constant slides that start at the top and gather more and more material until they include many tons as they reach the bottom. These slides often bring down single pieces weighing several tons. Under these conditions the importance of having a machine of long digging reach cannot well be overstressed. The loading equipment is a Bucyrus 80-B steam shovel with 48-foot boom and 32-foot dipper sticks, equipped with a 2-yard dipper. This machine with its long boom and dipper

Cutting Off the "Island" in the Gravel Pit. Left: Through the Box Cut the Big Shovel Loads Behind Itself. Center: Bird's-eye View Showing the Bucyrus 80-B Cutting Off the "Island" from the Main Face. The Slope on the Face in the Foreground Is the Result of Almost a Year's Weathering. In the Upper Right Can Be Seen the 41-B Stripping Shovel. Right: Opposite the 80-B the 20-B Clamshell Cleans Out Oversize and Clay in Order to Help Speed Up Operations.

handles is able to stand far back from the treacherous bank while loading the material into cars on the track that parallels the face.

Derailments Few and Quickly Handled

The shovel is served with 6-yard Western dump cars, hauled in trains of six by Milwaukee gasoline locomotives. The maximum run from the camp to the north end of the quarry is about a mile. The haulage track is kept in good shape, and the train crew is held responsible for steady operation, every derailment being charged against their record. Each locomotive carries a set of rerailing frogs, and with these the crews take care of a minor derailment rather than report to the foreman and have it marked up against them.

In the Gravel Pit the Cemented Material Sometimes Gives the 80-B a Tough Tussle.

A central gas station and lubricating oil supply, in charge of the pit foreman, enables gas and oil consumption to be carefully kept track of. Every night before the last trip the gasoline tanks of the locomotives are filled and a certain amount of lubricating oil given out. An accurate record of this is kept, creating an incentive to lower fuel consumption and giving rise to a certain rivalry between the engine crews for low gas and oil records. They check the number of trips with the shovel engineer's record of the trains loaded and with the plant dump crews record of the loads dumped on to the receiving blade. It has long been an established custom to make the tonnage per day record and the gasoline and oil consumption the basis for adjusting wage rates.

With the exception of a small blasting crew who drill and blast the oversize, the entire pit is operated by the pit foreman, the shovel engineer, a fireman and a pitman.

Underlying the pit is a floor of limestone, but, for ease in laying track, several feet of gravel is left on top of this floor. A central compressor plant supplies air to the drillers through an air line laid, with a water line, parallel to the loading track.

Production 4000 Tons Per Day Through Season

Four thousand tons a day throughout the season is no mean production for a 2-yard shovel, neither is this quantity of material readily crushed, screened and washed unless the plant is efficiently managed and the flow of material carefully synchronized. The cars from the quarry drop this material over a feeder blade which feeds a No. 12 Allis-Chalmers gyratory crusher and prevents the overloading of any part of the plant by supplying a constant flow of both large and small material to the primary crusher. From the primary crusher a 45-foot elevator carries the material to a scalping screen with perforations of 1⅞ inches. From here the material goes to a bin whence it is fed to two No. 6 Allis-Chalmers gyratory crushers and to two No. 6 high-speed crushers which each produce 90 tons per hour.

From the No. 6 crushers a 75-foot elevator empties the material into a hopper, which distributes it three ways to three sets of O'Laughlin screens where the washing water is played over it. These screens produce the following sizes:

Drilling Oversize for Blasting Behind the 50-B in the Limestone Quarry.

2-inch, 1½-inch, ¾-inch, and 7/16-inch; 5/16-inch and smaller is considered sand. The dirty water is discharged from the top of the sandbar through a trough to a nearby abandoned quarry.

Altogether, almost 5,000 gallons of water per minute is used to operate the plant and the pit equipment. This is supplied by a No. 6, a No. 8 and a No. 4 Allis-Chalmers centrifugal pumps, all electrically driven.

Switching Methods Give Marked Economy

The loading of the material into railroad cars is accomplished by gravity from the bins to cars

This Is the Kind of Digging that the 50-B Is Nosed Into.

on two loading tracks running underneath the plant and paralleling the main line of the railroad. These two track tunnels join the northern or "empty yard" with the southern or "load yard." All track on the property is laid so that there is a descending grade of three and one-half inches per hundred feet from the north to south, enabling

The Stratification of the Limestone in the Quarry Causes the Rock to Stand Up Even After Blasting. The 50-B Often Has to Reach Out and Topple Over One of These Big Masses Before the Shovel Cuts Into the Danger Zone.

all sorting and moving of loaded cars to be done by gravity.

A 2-drum American hoist with a one hundred and thirty-five horse power motor has been very cleverly arranged by Mr. Wolf to serve the tracks to both tunnels and to overhaul the car pulling line. The equipment will handle from the empty car yard into the tunnels complete trains of 38 empty cars; an overhaul cable returning the hauling cable to the upper end of the yard.

The Shovel Crews at Waukesha "Look Pretty" for Our Photographer.

At the Left Is Walter Soat, Operator of the 50-B, Behind Him Stands Fred Graf, Fireman on the Same Machine.

Behind the Levers of the Three-Quarter-Yard Clamshell We Find Merle Gigious with Ed Albright, Fireman, Beside Him on the Running Board.

In the Quarry Leon Jorgenson Runs the 50-B and Berno Turkoski Produces the Steam.

A Panorama View Showing the Sand and Gravel Plant and the Approach to the Primary Crusher at the Left, and the Limestone Quarry in the Center with the Dust Plant at the Right, then the Crushed Stone Plant with the Old Lime Kiln at the Extreme Right.

Limestone Plant Across the River Produces Many Bi-Products

To the west of the gravel plant, on the other side of the river and railroad, lies the limestone quarry and plant which, although modern and efficient, is remarkable because of its unusual utilization of bi-products rather than any particular feature of its crushed stone production.

The limestone is loaded out by a Bucyrus 50-B steam shovel into trains of two 4-yard Western dump cars hauled by a Milwaukee gasoline locomotive to a 44-inch by 60-inch Allis-Chalmers jaw crusher. An Allis pan conveyor carries the material to a No. 7½ Allis crusher and then to a set of power and mining rolls which bring it to a maximum of 2-inch size. From this roll mill the crushed stone goes through a set of O'Laughlin screens, producing 2-inch, 1½-inch, and ¾-inch rock as well as coarse screenings.

This Is the Way the Williams Bucket on the Clamshell Handles Oversize.

The mechanical operation is almost exactly like that of many limestone quarries throughout the country, but the difference comes in the diversity of products, orders for broken stone are filled by loading into railroad cars or motor trucks from the crushed stone bins; but when there are no unfilled orders for a certain size of rock that size, instead of going to the bin, it is sent through to the bi-products plant.

Bi-Product Plant Stabilizes Output

Here at the bi-products plant is made chicken grit, screened through a ten-mesh; Terrazo, a somewhat larger size used for concrete floors; ten-mesh limestone used for fertilizer, and powdered limestone (through a 200-mesh screen) sold for the rock dusting of mine entries, or for use in tuberculosis sanitariums, and, mixed with certain chemicals, as cattle feed.

The raw material is brought to the bi-products plant on a steel sandwich belt 16 inches wide and conveying 350 feet. This belt, which is perfectly flat, is used because damp material will not stick to it. Discharged from this conveyor belt the material is dropped into a rotary drier 60 inches in diameter by 50 feet long. Here the material remains for 23 minutes to dry in the heat from four oil burners. The rock is "bone-dry" when it leaves the drier, and is elevated to a bin passing on its way over a magnetizing pulley. From the bin it goes to two No. 2 Allis-Chalmers pulverizers, then is elevated to two Tyler-Hummer screens. These screen to ten mesh, the resulting material being used for either chicken grit, Terrazo, or fertilizer. After passing over the Hummer screens, the material destined to be utilized as dust is delivered to a Smith tube mill 62 inches in diameter and 22 feet long, loaded with 26 tons of Allis-Chalmers convict beds. After its passage through this mill the material is elevated and bagged on a Bates Valve Bagger.

New Product, Amesite, to Be Produced This Year

In the old days the property operated a lime kiln, and although for some time this has not been

Three-Quarter-Yard Steam Clamshell Working Opposite 80-B in Opening Up the Box Cut to Separate the "Island" from the Main Face.

(Continued on Page 307)

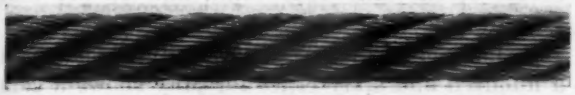
FIELD NOTES

Right Lay — Lang Lay — Left Lay — Regular Lay

By Oscar Hellgren, *Wire Rope Splicer, East Chicago Plant, Youngstown Sheet and Tube Company*

What "Lay" Means

"Lay" signifies the manner in which the individual wires and strands are *laid* into the completed rope. The rope that is most commonly used is that of "Regular" lay — so called because the wires in the strands are laid in the opposite direction to that in which the strands are laid into the completed rope. In this type of rope the internal stresses work in oppo-

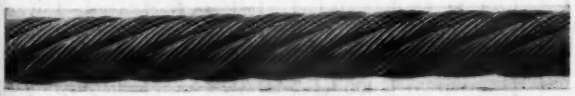


Left Lay Regular Lay.

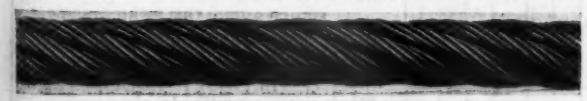
Right Lay Regular Lay.

sition to each other — in one direction in the strands and in the opposite direction in the completed rope — with the result that the stresses do much to equalize themselves and make the rope less "cranky," and easier to handle than would be the case if both strand and completed rope stresses were pulling in one direction. Whether the rope be Left Lay Regular Lay or Right Lay Regular Lay depends entirely on whether the strands are laid into the rope clockwise or counter-clockwise.

In an effort to provide the individual wires with a greater wearing surface and gain a more flexible rope, the principle of laying the wires and the strands was reversed. That is to say, the strands were laid into the completed rope in the same direction as were the wires into the strands. This is called "Lang Lay" rope and offers several advantages over "Regular" lay ropes, two of which are:



Left Lay Lang Lay.



Right Lay Lang Lay.

(a) Greater flexibility, because the outer wires of the strand are parallel to the axis of the rope against the manilla core and, therefore, set up less frictional resistance between themselves when bending.

(b) Lower bending stresses, the bending stress in a Lang Lay rope being approximately 80 per cent of that in a Regular Lay rope of the same construction and length of Lay.

However, there are disadvantages to Lang Lay over Regular Lay rope, for example:

When using Lang Lay it is absolutely essential that all auxiliary equipment, (sheaves, etc.) be in the best of condition, since a pinching sheave, for instance, will more readily deteriorate Lang Lay than Regular Lay rope. It will be obvious that to squeeze or pinch a Lang Lay rope — where the wires within

Partially Worn Regular Lay.

Partially Worn Lang Lay.

the strands lay in the same direction as the strands within the rope — will more readily force the wires or strands to lift out of their proper place. This is called "bird-caging."

As in all ropes, Right Lay Lang Lay or Left Lay Lang Lay may be determined by whether the strands are laid in the rope clockwise or counter-clockwise.

(To be continued in the next issue of The Excavating Engineer)

New Space Added to Road Show Exposition Hall

Fifteen thousand additional square feet of space will be available to exhibitors at the 1929 Road Show and Convention which will open in Cleveland on January 14, 1929. The completion of the new South Wing of the Exposition Hall makes this additional space possible. The space will be assigned at the annual meeting of the Allocation Committee.

Details in connection with the Cleveland meeting are rapidly being perfected. Reduced railroad fares will again be in effect for all attending the Convention and Road Show. Additional hotel rooms will be available, assuring the delegates of sufficient desirable rooms.

Has Anyone a Copy of the First Steam Shovel Patent?

The Excavating Engineer has been asked to obtain a copy of patent number 1089 issued to William S. Otis of Philadelphia on February 24th, 1839, for "Crane Excavator for excavating and removing earth."

This patent is the patent on the original steam shovel, and, while we have in our files a copy of the text of the patent, we have been unable to locate a copy of the drawing.

The Editor will appreciate hearing from anyone who has such a copy or knows of the existence of one.

The EXCAVATING ENGINEER

A Monthly Publication Devoted to Excavating and Allied Subjects

REGULAR SUBSCRIPTION: $1.00 a year for 12 numbers.
SPECIAL SUBSCRIPTION: Upon application on card inserted in this number, subscriber's name will be placed on Rotating List, whereby he will receive The Excavating Engineer frequently (not regularly) free of charge.

THE EXCAVATING ENGINEER PUBLISHING CO.
F. O. WYSE, Manager-Editor ARNOLD ANDREWS, Associate Editor
South Milwaukee, Wisconsin
Printed in the U. S. A.

The Business Situation

The first six months of 1928 from the standpoint of the average business man has been no record breaker and yet no heart breaker. It has neither justified the worries of the pessimist nor the glowing anticipation of the optimist who thought that it would set new records of prosperity.

The building industry has done exceptionally well. June construction contracts in the territory east of the Rocky Mountains broke all previous June records, according to F. W. Dodge Corporation. New building and engineering work contracted for last month in the 37 Eastern States (including about 91 per cent of the total country) amounted to $650,466,200. This figure was the second highest monthly total on record. It was 3 per cent ahead of the June 1927 record and was only about two and one-half per cent under the total for the preceding month of this year.

Last month's contract total made another record. It brought the total amount of new construction work started in these states since the first of this year up to $3,444,867,500, which was the largest first six-months' total on record. The increase over the first half of last year was 8 per cent.

The June contract record included the following important classes of work: $258,083,700, or 40 per cent of all construction, for residential buildings; $130,852,400, or 20 per cent, for public works and utilities; $93,942,200, or 14 per cent, for commercial buildings; and $63,536,700, or 10 per cent, for industrial projects.

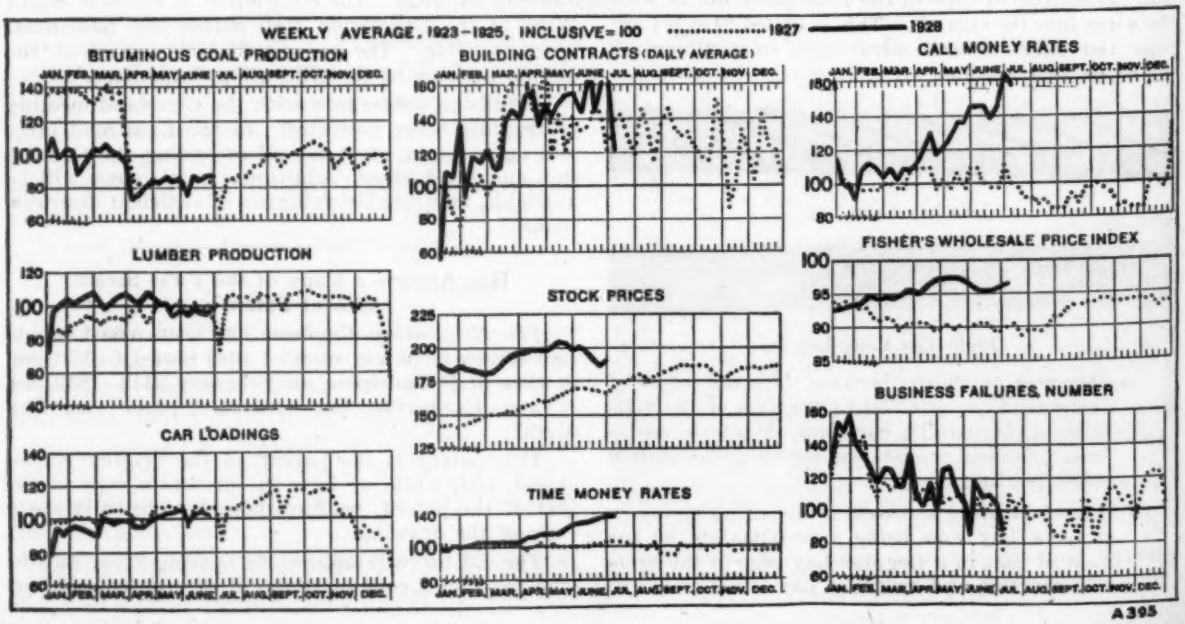
Contemplated new work reported in June amounted to $1,030,095,000, being 17 per cent in excess of the May 1927 total, and 41 per cent ahead of the June 1927 record.

Bradstreet's statistics on building permits in a hundred and sixty cities for May shows a gain of 6.8 per cent over that month in 1927 and a decrease of seven-tenths of one per cent in the five months ended with May.

Large power projects continue to be a feature of construction work. The New England Power Company is reported as having spent upwards of $1,000,000 in the last year upon surveys and the purchase of property along the famous fifteen-mile falls between New Hampshire and Vermont for a power development which will be the largest east of the Mississippi River, with the exception of Niagara Falls. A total expenditure of $40,000,000 is planned.

The semi-annual survey of the real estate market just completed by the National Association of Real Estate Boards, covering 318 cities, shows

WEEKLY BUSINESS INDICATORS



that the market was more active than it was a year ago in 37% of the cities reporting, while 32% reported the market the same as last year and 31% reported less activity. Selling prices were reported higher than a year ago by 14% of the cities, the same in 55%, and lower in 31%.

The stock market has responded to some extent to the endeavors of the Federal Reserve Bank and co-operating banks to reduce the credit extension. This curbing of credit extension has, apparently, not been carried as far as it is deemed advisable. The "tightening" of money is a safeguard which will keep money available for business rather than work a hardship upon it.

"Disgusting," I Calls It

The Owners contract
With Tom, Dick or Joe
For a Price that will steal your shirt
Till there ain't any room
For an Honest Gazoom
To make money on digging their dirt.

The above little verse, sent us by A. Bryon Hunicke of The Foundation Company, 28 East Jackson Boulevard, Chicago, Illinois, is a forceful summary of the feeling of reputable contractors everywhere concerning the irresponsible bidder. Much has been said on the subject, but it seems that some owners still are unable to see the light. They fail to realize that letting a contract at a figure which obviously will not let the contractor out with a legitimate profit means inferior work, delays, and grief even if they are properly protected by a satisfactory bond.

Perhaps we can do our bit in helping the situation by offering the following ironical advice to the contractor. It comes to us from S. A. Lacy, General Contractor of Anniston, Alabama.

Why Is a Contractor?

Don't try to make any money in your business,
You should be satisfied with the work and worry —
That should be reward enough.
Talk about your "wonderful rainbows" until you believe it yourself.
Invest all your capital and as much more as you can beg, borrow or steal.
Don't figure interest or profit —
That's old stuff. Not done now.
Show your fellow-contractors that they have not been taking work at actual cost or below.
Bid the job a-w-a-y d-o-w-n! Show them that YOU THINK that the actual cost (or less) is 'way tahelangone below their bid figure.
The proper time to show up your fellow-contractor is on the
First jobs that come up each year.
Later in the season you might not have as large an audience.
If you know you're losing money on your work, get
Another job at still lower price.
Lap the second job into the first one —
It may keep you from going crazy until a later date.
This method also helps as a Smoke
Screen to fool yourself, your
Backer, bankers and material and equipment men.
Don't figure in "Overhead" or "Traveling" expense.
There ain't no such animals. Don't figure in "Depreciation" —
It's too damn big a word to be understood in contracting.
Never admit to yourself — or anyone else — that if you did fifty
Per cent of a certain volume at a
Reasonable Price you would make
More real money than to do twice as much at No Profit.
Always be mentally and physically fit to be able to laugh off
Such things as Delayed Estimates,
Call Loans from Banks, Material
Shortages, Pay Rolls and Freight
Bills, Breakdowns, Rain and
More Rain, Strikes and Long Hauls,
Hot Weather and Dry Weather,
"Pleasant" Inspectors and Cement
Overrun, Low Grade, Water Shortage and Accidents, Shutdowns and Long Hours, etc., etc., etc.
Always treat your fellow-contractor friendly to his face,
Then stick your knife in the left side rear —
You can reach his heart best at that point.
If you are "second" or worse at a letting, slip around to the powers
That be. Tell them you made an error and if the job is relet you
Will bid lower. Manage somehow to create dissension.
Aim to attend all contractors' meetings. Say as little as you
Can yourself, but get all the information you can about your
Competitor's business. If you are asked to talk about your work,
Duck the issue!
Never buy of the material man who went along with you on the bid.
Tell him he is "out of luck." Buy from the fellow who was riding
With the other bidder, his man lost, so you're his meat.
Never get well acquainted with your competitors, or put your cards on the table with them —
They might be bigger and better fellows than you thought.
Don't be satisfied with enough work to start the season at a
Decent price. Fill up on work 'til it runs out your ears —
At any old price.
Contracting statistics show that ninety-five per cent of contractors go broke.
Don't break the rule by lowering the percentage.
Don't let a little thing like the future of the wife and kids
Bother you. The states and counties have provided institutions
For their care — or your wife can get out and get a job
if you should kick off.
Abide by these standards. Pep up the industry and create a
Vacancy for other damn fools as they come along.

— *Tri-State Contractor.*

Mines and Quarries Establish Notable Safety Records

Especially noteworthy instances of the long-continued operation of large mines and quarries without injuries to employees are revealed in the announcement of the leading participants in the National Safety Competition held during the calendar year 1927 under the auspices of the United States Bureau of Mines, Department of Commerce. A large Michigan iron mine, two non-metallic mineral mines located in Illinois and Ohio, and 27 quarries and open-pit mines located in Texas, Kansas, Pennsylvania, California, Alabama, Indiana, New York, Minnesota, Kentucky, Maryland, Ohio and Michigan were operated throughout the year without a single accident involving loss of working time on the part of an employee. Two hundred and fifty-six mines and quarries, representing 31 states, were represented in the contest. The total amount of exposure to hazard was 91,919,812 man-hours. In addressing congratulatory letters to the winning mines or quarries in each group of contestants, Secretary Hoover of the Department of Commerce declared that the achievement represented a definite contribution to the personal welfare of industrial workers and marked a forward step in the elimination of unnecessary accidents in American industry. Commendatory letters were written by Director Scott Turner, of the Bureau of Mines, to the various mines and quarries awarded honorable mention in the contest.

The holding of the National Safety Competition in 1927 marked the third consecutive year of this notable endeavor to reduce, through the medium of friendly competition, the number of personal injuries in the mines and quarries of the United States. Competing companies were grouped into five classes, namely: anthracite mines, bituminous coal mines, metal mines, non-metallic mineral mines, and quarries and open-pit mines. To the winning company in each group was awarded the bronze trophy Sentinels of Safety, the gift of The Explosives Engineer magazine. The winner in each group was the mine or quarry whose record showed the smallest loss of time from accidents in proportion to the total amount of time worked by all employees. The competition for the trophy was restricted to mines employing at least 50 men underground, and to quarries and open-pit mines employing at least 25 men in the pit.

First place in the anthracite mining group was awarded to the Jeddo-Highland Coal Company's Highland No. 6 mine, at Jeddo, Luzerne County, Pennsylvania. This mine worked 134,680 man-hours in 1927 and had a loss of only 0.119 days per thousand man-hours of exposure.

Honorable mention in the anthracite mining group of contestants was given to the Upper Lehigh mine, of the Hazlebrook Coal Company, Upper Lehigh, Pennsylvania; the Jeddo No. 7 mine, of the Jeddo-Highland Coal Company, Jeddo, Pennsylvania; the Ebervale mine of the Jeddo-Highland Coal Company, Jeddo, Pennsylvania; and the Lawrence mine, of the Harleigh-Brookwood Coal Company, Mahanoy Plane, Pennsylvania.

No. 2 mine of the United States Coal and Coke Company, at Gary, West Virginia, was the leader of the bituminous coal mine group. This mine's record showed 688,937 man-hours worked in 1927 with an accident-severity rate of 0.132 and an accident-frequency rate of 1.5, while the average rates for the whole bituminous group were 15.739 for severity and 97.3 for frequency.

Honorable mention, in the bituminous group, was given the No. 4 mine of the United States Coal and Coke Company, at Thorpe, West Virginia; the Panther mine of the United States Fuel Company, Heiner, Utah; the No. 9 mine of the United States Coal and Coke Company, Filbert, West Virginia, and the No. 8 coal mine of the United States Coal and Coke Company, Elbert, West Virginia.

Bristol iron-ore mine at Crystal Falls, Iron County, Michigan, operated by the Bristol Mining Company, won first place in the metal-mine group. The Bristol mine was operated in 1927 without a lost-time accident, although the mine employed about 140 men and worked 434,916 man-hours.

In the metal mine group, honorable mention was given the Lucky Bill lead and zinc mine, of the Federal Mining and Smelting Company, Cardin, Oklahoma; the Berkshire iron-ore mine of the Brule Mining Company, Stambaugh, Michigan; the Armour No. 2 iron-ore mine of the Inland Steel Company, Crosby, Minnesota, and the Lucky Jew zinc and lead mine, of the Eagle-Picher Lead Company, Treece, Kansas.

The best record among mines producing non-metallic minerals other than coal was established by the Marquette Cement Manufacturing Company at the company's limestone mine at La Salle, La Salle County, Illinois. This mine was operated without a lost-time accident in 1927. During the year the employees worked 205,601 man-hours.

Honorable mention, in the non-metallic mineral mine group, was given the Ironton cement rock mine of the Alpha Portland Cement Company, Ironton, Ohio; the Missouri Portland Cement Company limestone mine, Cement City, Missouri; the Manheim cement rock mine of the Alpha Portland Cement Company, Manheim, West Virginia; and the Southard gypsum mine of the United States Gypsum Company, Southard, Oklahoma.

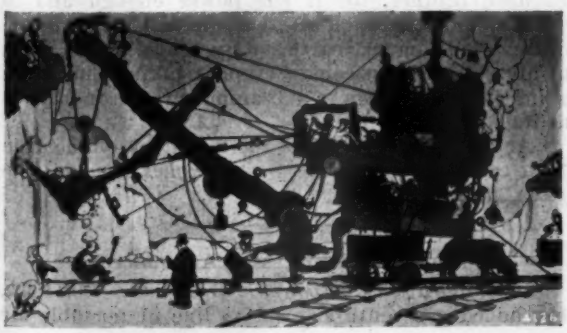
The leading plant among quarries and open-pit mines was the Mitchell limestone quarry, at Mitchell, Lawrence County, Indiana, operated by the Lehigh Portland Cement Company. The Mitchell quarry and crusher were operated without a lost-time accident in 1927; its volume of exposure was 308,886 man-hours.

In the quarry and open-pit mine group, honorable mention was given the following contestants: Ormrod limestone quarry, of the Lehigh Portland Cement Company, Ormrod, Pennsylvania; Union Bridge limestone quarry, of the Lehigh Portland Cement Company, Union Bridge, Maryland; Security cement rock quarry, of the North American Cement Corporation, Security, Maryland; Union Limestone Company quarry, Hillsville, Pennsylvania; Bath limestone quarry, of the Lehigh Portland Cement Company, Bath, Pennsylvania; White Haven sandstone quarry, of the General Crushed Stone Company, Whitehaven, Pennsylvania; Louisville Cement Company cement rock quarry, Speed, Indiana, Texas Portland Cement Company limestone and shale quarry, Dallas, Texas; Kansas Portland Cement Company limestone

and shale quarry, Bonner Springs, Kansas; Ash Grove Lime and Portland Cement Company limestone quarry, Chanute, Kansas; Pennsylvania-Dixie Cement Corporation Plant No. 6 cement rock and limestone quarry, Nazareth, Pennsylvania; Iola limestone quarry, of the Lehigh Portland Cement Company, Iola, Kansas; Cowell Portland Cement Company lime rock quarry, Cowell, California; Alabama Portland Cement Company limestone quarry, Birmingham, Alabama; Lehigh Lime Company (Mitchell) limestone quarry, Mitchell, Indiana; Helderberg limestone quarry of the North American Cement Corporation, Howes Cave, New York; York open-pit iron-ore mine, of the York Iron Mining Company, Nashwauk, Minnesota; Sandts Eddy limestone quarry of the Lehigh Portland Cement Company, Sandts Eddy, Pennsylvania; Sandusky Cement Company limestone quarry (silica), Toledo, Ohio; Wickwire Spencer Steel Company limestone quarry, Gasport, New York; Pennsylvania-Dixie Cement Corporation Plant No. 4 cement rock quarry, Nazareth, Pennsylvania; Olive Hill Limestone Company crushed limestone quarry, Olive Hill, Kentucky; Martins Creek No. 3 cement rock quarry, of the Alpha Portland Cement Company, Martins Creek, Pennsylvania; Alabama Portland Cement Company shale quarry, Birmingham, Alabama; Bellevue cement rock quarry, of the Alpha Portland Cement Company, Bellevue, Michigan; Consolidated Cement Corporation limestone quarry, Mildred, Kansas.

The records of the National Safety Competition of 1927 again demonstrated the fact that most mining and quarrying companies are succeeding in their efforts to prevent accidents to their employees, the Bureau of Mines points out. This is indicated by the records which showed that a majority of the companies had accident-severity rates lower than the average rates for their respective groups.

An English Cartoonist's Idea of a Steam Shovel



Through the courtesy of "Concrete" we present this cartoon furnished by G. & T. Earle, Ltd., of England, and depicting "the Wonders of Wilmington."

Coolidge Dam — A New Type of Construction

(Continued from Page 293)

to the loading hoppers of the Bleichers aerial tramway.

Camp Modern in Every Respect

The camp now presents the appearance of a modern community, with a store, butcher shop, barber shop, clubroom, mess hall, first aid station, electric lights, sewer and water system, and the latest model of three-room rural school building, accommodating three teachers and some seventy-five children.

At the present writing practically all excavation has been completed and 165,000 yards of concrete have been poured. Concrete placing started November 25th last year, and such rapid progress has been made that the contractors expect to finish the dam this fall although the time limit of the contract does not expire until July 1, 1929.

The design and supervision of construction for the government has been under the direction of Major C. R. Olberg, assistant chief engineer of the United States Indian Irrigation Service; C. H. Southworth is construction engineer and H. C. Neuffer, engineer of designs. For the contractors, Elmer Kier is resident manager, and has been ably assisted by James G. Tripp, general superintendent. C. G. Clapp is master mechanic and assistant superintendent; Edgar White is construction engineer for the contractors; while Hiese Fiestich has charge of excavation.

Crushed Rock to Cattle Feed — All in One Plant

(Continued from Page 302)

in operation the company is now installing a Symons cone with an Allis-Chalmers textrope drive for amesite purposes.

Ever on the alert for a new market for their products the Waukesha Lime & Stone Company are now blasting an entry from their present quarry through to an old quarry several hundred feet south. When joined to the northern end, the southern portion will be used to produce building stone, while the northern end will be used to produce the rock for the bi-products plant. The distance between the two quarries is enough so that the dynamite blasting will not disturb the rock in the southern end, where, of course, only black powder will be used.

Stripping Completed for Eight Years' Operation

Last year the overburden was removed from 15 acres just ahead of the present face of the gravel pit. On this stripping, handled by contract, a Bucyrus 41-B steam shovel was used, loading Western two-yard narrow-gauge dump cars hauled by a Plymouth gasoline locomotive. The overburden, of which there was nearly half a million yards, was hauled to the south end of the property and dumped into the pit where the gravel has been removed right up to the line. The stripping makes possible eight years of operation without any further overburden removal. Further stripping operations at the limestone quarry are planned in the schedule for this season.

From THE MAIL BAG

MINISTERE DE LA VOIRIE
PROVINCE DE QUEBEC

Quebec, June 21, 1928.

F. O. Wyse, Managing Editor,
The Excavating Engineer,
South Milwaukee, Wis.

Dear Sir:

In *The Excavating Engineer* of June 1928, I note an article entitled "$2,500,000 Damage to Quebec Roads."

This article does not picture at all the situation in Quebec resulting from rainfalls last year, and recent floods, and is liable to mislead the public as to the conditions now existing in Quebec. Damages suffered by Quebec roads last fall and this spring have been grossly exaggerated. Of course, damages were suffered, but owing to the complete organization of the Quebec Roads Department, repairs followed swiftly and, at the present time, all roads in Quebec have resumed their normal condition and are in perfect shape. Even in Lake St. John District, where the damage, although exaggerated, was real, the roads are in good condition and practically no trace is left of the floods.

For your information, I am sending herewith copy of the Official Bulletin dated June 9, which has an article relating to road conditions after the floods. Official Bulletin No. 3, to appear June 23 instant, will be sent also and will show further improvement.

Regarding new construction, the Quebec program was not altered owing to necessity of repairs of flooded sections. The Honourable Mr. Perron, Minister of Roads, issued lately a statement showing that the program will be carried out with the utmost energy and that approximately 1000 miles of new roads will be added to the system at the end of 1928.

I would be obliged if this letter was printed in a subsequent issue of *"The Excavating Engineer,"* in order that your readers may be thoroughly informed on existing conditions in Quebec.

Believe me,

Yours very truly,

J. B. BOULANGER,
Deputy Minister.

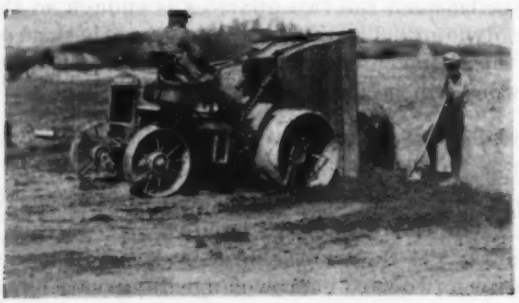
JLB/AB/JLF

The item referred to, published in the June issue of *The Excavating Engineer,* was furnished by *The Bureau of Public Roads, Washington, D. C.* We are glad to correct any misunderstanding which may have been given by our previous item through publication of Deputy Minister Boulanger's letter reproduced above.

DEVICES YOU OUGHT TO KNOW ABOUT

A New Breed of Iron Mule

The 10-20 McCormick-Deering has entered a new field of usefulness. The Hughes-Keenan Company, Mansfield, Ohio, have converted it from a power plant into a complete shore haul dump unit by equipping it



with a two-yard dump body of gravity type, which dumps a load and returns to loading position automatically.

A great feature of both the original Fordson Iron Mule and the new McCormick-Deering is that the driver loses no time jockeying for position, because, through change in direction of drive, he always faces the load and can see just where he wants to dump it and can run under a bucket or dragline squarely at the first attempt. This new breed of Iron Mule should become as famous for slicing hauling costs as its Fordson brother, for it has power enough and to spare to mush through all weathers and traction conditions, mud, muck, earth, stony roads, or no roads at all where virgin construction is taking place. In going that sticks trucks and animals the Iron Mule is at its best.

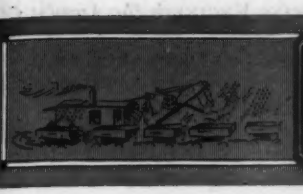
Anyone who would like the full story of the Iron Mule can get it by writing to the *Hughes-Keenan Company, Mansfield, Ohio.*

New Size Compressor Announced

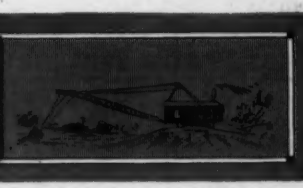
Ingersoll-Rand Company, 11 Broadway, New York, has added a seventh size to its line of portable air compressors.

This new size (4¾-inch bore by 4-inch stroke) has a piston displacement of 82 feet per minute. It is intended primarily for use by contractors, public utilities, cities, towns, etc., requiring a unit of slightly larger capacity than the 4¼-inch x 4-inch 66-cubic-foot machine.

The new compressor, like the other I-R Portables, is equipped with a four-cylinder, tractor-type Waukesha motor. It is available on broad-faced steel wheels, on steel wheels with rubber tires, on I-R trailer mounting, on Ford or Chevrolet truck, or without running gear for mounting on skids, railway car, etc.



SHOTS FROM THE FIRING LINE



Boston and Vicinity

BY E. J. O'CONNOR

Ralph M. Davis, Oldtown, Maine, is getting along fine with his road job near Ellsworth, Maine. Manzie Rogers of Bangor, Maine, had the adjacent section last year.

James H. Kerr of Rumford, Maine, has been awarded a real job in Vermont in connection with reconstruction of flood damage. The contract calls for completion in 105 working days and he has over 100,000 yards of earth to move.

The first section of the widened Newburyport Turnpike is rapidly approaching completion. M. McDonough Co., of Swampscott, Massachusetts, have the contract for this job. It is planned to widen the whole stretch of forty miles to thirty feet.

Herbert Wright of Worcester has completed his excavation work for Amos D. Bridges and Sons on the Boston-Portland Road. His Erie GA-2 is on its second year now and has caused him but one-half day's delay so far. Herb sure likes the Gas + Air!

Road work has been progressing slowly this year on account of the heavy rains. With the coming of the hot spells, better progress will be achieved. We understand, however, that P. J. Holland squeezed in between the showers one run of 1760 feet of reinforced concrete ten feet wide this year.

A. Susi & Co. of Boston have not landed a big job yet this year. They have been second bidders several times and will, undoubtedly, crash through soon.

Dannie Keefe is still working for T. Stuart & Sons on a Bucyrus 20-B used in reconstruction work for the new North Station in Boston.

Very little heavy excavating work has been done in Boston this year, the building business being quiet.

Canada

Montreal and Vicinity

BY J. M. WARD

The Quebec and Chibougamoo Railway has let contract for 60 miles of grading and bridges to A. Deslauriers, Limited, of Quebec City. This work is to be proceeded with at once.

We had a visit from William Wilson, Montreal, who tells us that his two Bucyrus-Erie B-2 shovels are kept busy right along.

L. A. Ott & Co. are keeping one of the Bucyrus 20-B shovels busy on a stripping contract for the National Cement Co. His second 20-B and the Bucyrus-Erie B-2 are out excavating around Montreal.

The Foundation Co. of Canada, Ltd., has a large contract for a pulp and paper mill in Nova Scotia. They have sent their Bucyrus 31-B shovel down to this job.

We had a visit from C. V. Johnson, Chief Engineer for A. Deslauriers, Limited, Quebec. Mr. Johnson is preparing to start work on the Quebec and Chibougamoo Railway at once.

A SMOOTH FIRM GRIP

No jerking or grabbing with *Asbesgraphite!* On shovels, dredges, draglines, cranes, hoists, pavers, trucks, etc., this Gatke product has proved its ability to give longer life, trouble-free service, and ability to speed up operations because of better and smoother control.

Asbesgraphite is a self-lubricating, non-scoring asbestos friction material unaffected by heat, cold or moisture.

It ends friction troubles.

You are missing a bet if your machines are not Asbesgraphite equipped. The cost of a trial installation is negligible. It's not an experiment, for we guarantee satisfactory service—*order today.*

It is not Asbesgraphite unless it is marked "GATKE"

We also manufacture Asbestos Brake Lining in any width, thickness or length

ALL SIZES CARRIED IN STOCK

For
Marion, Bucyrus,
Monighan, Osgood,
Northwest, Byers,
Ohio Locomotive,
Industrial, P. & H.,
Keystone Driller,
Massillon, Thew,
Erie, Page,
Moore Speedcrane,
Link Belt,
And Others.

THOMAS L. GATKE

Manufacturer

Chicago Office: Railway Exchange Building
Factory: Winona Lake, Indiana

ASBESGRAPHITE
ASBESTOS COMPOSITION

For
Allis-Chalmers,
Nordberg,
Wellman-Seaver-Morgan,
Ottumwa Iron,
Lidgerwood, Mundy,
Flory, Mead-Morrison,
Orr & Sembower,
Clyde, American,
Lambert,
Thomas Elevator,
And Others.

In writing to Thomas L. Gatke please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Jack Buist was relieving on a Bucyrus 20-B shovel for Gorman & Peckham, while Bill Normand was laid up. We understand Bill is back on the job again.

J. H. Giroux & Co. of Deschambault, Quebec, are using a Bucyrus 31-B in a quarry which they opened up at that point last year.

Toronto and Vicinity

BY C. F. ENGLAND

R. C. Huffman Construction Co., Limited, have the contract for the excavation and four bridges at Hamilton. This is in connection with changes which are being made by the Canadian National Railways to accommodate their new station.

McNamara Construction Co., Ltd., are getting along nicely on their sewer contract at Kirkland Lake, Ontario.

Curran and Briggs are making good progress on their contract for the Department of Public Highways. This job entails some twelve miles of grading and several culverts.

J. D. Armstrong of Hamilton has had a number of excavation jobs recently, among which is The T. Eaton Building, Hamilton, and the Masonic Temple, Oshawa.

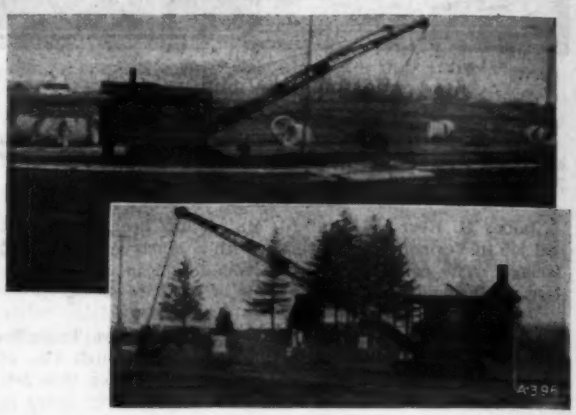
Detroit and Vicinity

BY P. M. RICHARDS

The Koenig Coal & Supply Company now have their new gravel pit east of Oxford in production. They are using a Bucyrus-Erie 50-B Ward-Leonard shovel.

The City of Detroit have their Bucyrus-Erie B-2 working at the House of Correction at Plymouth.

The National Lime & Stone Co., Bluffton-Lewisburg Stone Co., and National Quarries Co., have consolidated and are maintaining their offices in Findlay.



Joseph Rossi has completed one part of his Dearborn job and has moved on to the second section west of Telegraph Road. He is using his Bucyrus-Erie 50-B and 41-B machines, shown above and also is using A. C. Duesing's Bucyrus 30-B steam.

James & Sons were low bidders on Wayne County Drain on July 9th.

Edward Bodette & Sons of Toledo have completed a dredging job for Mr. Grey at Gray Haven, an exclusive residential section on the St. Clair River.

Central Contracting & Engineering Company have completed their Dearborn job and moved their equipment to Oakland County.

TWIN CITY ENGINES

Buckeye Bucket and Chain Type Trencher equipped with side cutters. Powered by Twin City 7¾" x 9" 6-cylinder engine.

"BUILT TO DO the WORK"

MINNEAPOLIS STEEL AND MACHINERY COMPANY, Minneapolis, Minn.

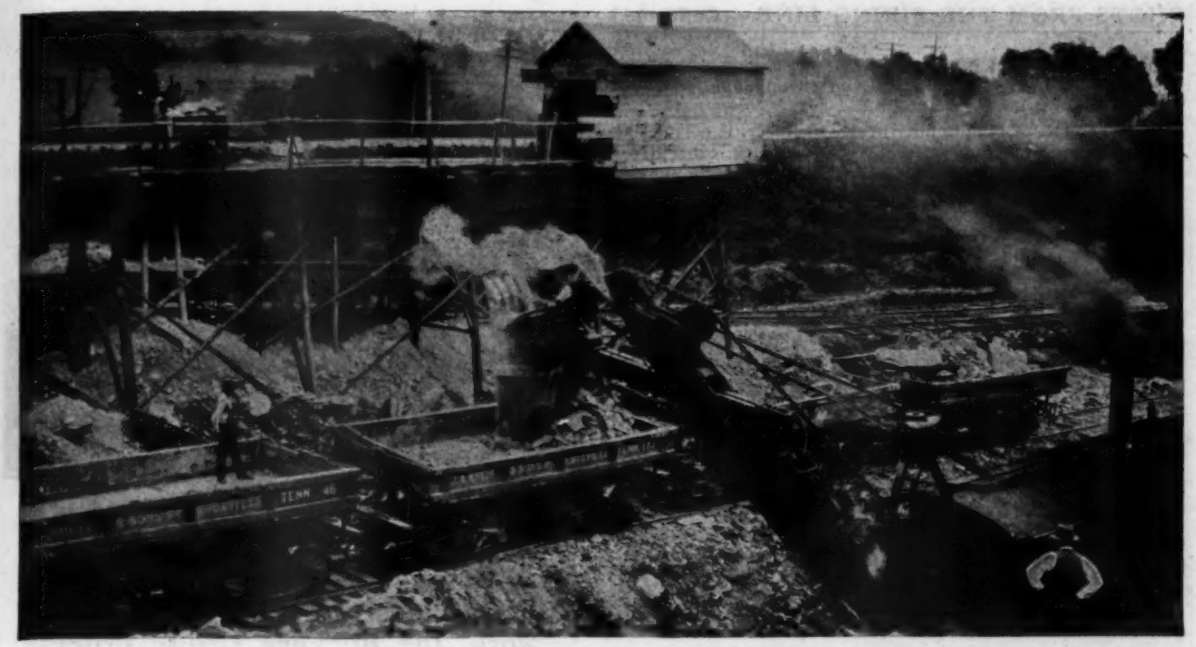
Heavy Duty Engine Manufacturers Since 1903

The ever-increasing Chain of TWIN CITY Users include the following:

35 to 140 H.P.

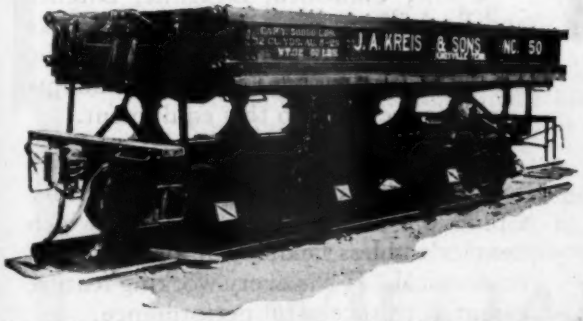
Browning-Cranes · Austin-Trenchers · Baldwin-Locomotives · Buckeye-Trenchers · Bucyrus Shovels and Cranes · Cement Gun-Contracting Co · North-West Shovels · Pennsylvania Compressors · Sargent Draglines · Star-Drilling Machine Co · Washington Logging Engines · Willamette Logging Engines

In writing to Minneapolis Steel & Machinery Co. please use post card bound in the center of this number.



One of J. A. Kreis & Sons, Inc., trains of Western 12-yard dump cars under the shovel. The shovel has a 2½-yard dipper that will pass large pieces of rock. They do not spare the cars on this job and the cars take it and have taken it for the last 12 years.

The Majority Agree on Westerns



One of the 90 12-yard Western cars J. A. Kreis & Sons, Inc., are using on their two million cubic yard contract on the Missouri Pacific.

ON the Missouri Pacific second track work between Allenton and Boles, Missouri, nearly all the contractors are agreed on one point. Of the 172 dump cars in use on this project, 148 are WESTERNS.

Western dump cars are low, compact, and of great strength. They are dependable, efficient and economical — qualities that are indispensable to low cost production.

Railroad contractors, whose profits depend on their ability to do the work cheaper than the railroads can do it, use Western Dump Cars.

Specifications and prices on request.

WESTERN WHEELED SCRAPER COMPANY

Aurora **Illinois**

WESTERN

Western

DUMP CARS AND GRADING EQUIPMENT

In writing to Western Wheeled Scraper Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Cecil Wheeler has his Bucyrus-Erie GA-2 on a subcontract for the R. D. Baker Company west of Birmingham.

H. A. Morse, Wayne County bridge engineer, is completing the widening of Grand River Avenue bridge over River Rouge west of Redford. This is an improvement in connection with the widening of Grand River between Detroit and Farmington.

Wisconsin Notes

BY E. P. DOYLE

Col. Starling found a mud hole at the end of the concrete road leading out of Superior toward Brule. He suggested that it be fixed, and the Wisconsin Highway Commission immediately started grading operations, and have just finished 224 feet of 18-foot concrete which was opened to traffic for the presidential party in 48 hours. This was accomplished due to the information gathered by the highway engineers while preparing to build the two experimental quality roads on Highways 68 and 12 this year.

E. S. Sicnarf writes that he is back again running a shovel in Milwaukee, and he will be glad to hear from other old-time operators at 304 South Summit Avenue, Milwaukee, Wisconsin.

The Schuster Construction Company has started grading and building culverts on three miles between Kiel and New Holstein. The cost was less than the funds appropriated and will allow the county to build a mile or two more next year in addition to work planned for 1929. It is planned to build five miles on either the Fond du Lac-Chilton Road on State Trunk Highway No. 55, from the Fond du Lac County Line north, or on United States Highway No. 10 from the Winnebago County Line east. Whatever funds are left over from this year will be added to next year's paving.

Cletrac

Crawler Tractors

FOR excavating, earth moving, hauling, grading and road work, Cletrac Crawler Tractors offer by far the most efficient, capable and economical type of power unit. They are built in a complete line to cover the entire range of power requirements.

It will pay you to investigate Cletracs, their greater power, traction and speed, their easier control and shorter turning, "One-Shot" instant lubrication and many other distinctive features.

Write today for literature.

The Cleveland Tractor Co.

Cleveland, Ohio

EMERGENCY SPEED

Crane Service

WHETHER it's a job behind schedule, a hurry-up special, or just ordinary daily run-of-work, the Buckeye Utility Truck-Crane will prove its worth quickly.

From truck to boom this handy little crane is built especially for speed—speed in operation, in travelling, and in increasing profits. Rugged construction and ample power unit qualify it to give dependable, low-cost operation for years.

Crane, Clamshell, Dragline, Ditcher and Backfiller, the variety of this Buckeye's applications is limited only by the ingenuity of operating officials in adapting their methods to this equipment.

Road, street and general contractors can profitably use this motorized Utility Crane on hundreds of jobs for which heavier and less flexible equipment is not economical. It has every working feature essential to successful performance.

Write for our interesting Crane Bulletin which gives complete specifications, operation and maintenance data.

The

Buckeye Traction Ditcher Company — Findlay, Ohio

There's a Buckeye Sales and Service Office Near You

for over thirty years **Buckeye**

The Largest WIRE ROPE in America christens the opening of our new plant — which doubles our productive capacity.

The most modern machinery known in the science of quality Wire Rope building is being placed in this mammoth new plant.

Equipment is being installed to make every unimportant operation "machine handled", thus enabling us to use the highest skilled men, where brain power is needed, to the end that even more safeguards are thrown around the manufacture of

WILLIAMSPORT WIRE ROPE

Telfax Tape Marked — Factory Certified

so that if a better rope is built — Williamsport will build it. And the Telfax Tape System of grade marking will protect your purchase.

Write us for further information about this protection.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works:
Williamsport, Penn.

General Sales Offices:
Peoples Gas Bldg., Chicago

Use Madesco Tackle Blocks — They Stand the Gaff.

In writing to Williamsport Wire Rope Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Jorgenson Construction, Denmark, Wisconsin, was awarded contract for road improvement at Sheboygan, Wisconsin, $91,413.

Paving the gap in State Trunk Highway No. 36 near Lyons has been assured by the State Highway Commission. The necessary $21,000 will be anticipated from 1929 funds. This will complete paving on this road throughout its entire length in the State, except a few miles between Lake Geneva and the Village of Walworth. The road will be relocated to avoid the main street.

According to Thomas Reilly, Engineer, Wisconsin Highway Commission, Argyle will be lifted out of the mud, by connecting with Green County's concrete. Contract for fixing up the one and one-half miles from Argyle to Green County Line has been let to Bill Ryan of Janesville. Funds for this improvement are provided by $23,000 of the 1929 county allotment of gas tax.

The Dane County Highway Committee has just let contracts for building 11 miles of gravel road in 1½ to 3-mile stretches throughout the county. According to J. R. Caldwell, County Highway Commissioner, the work is to be completed by September 1. Mr. Caldwell said that now the County has started on paving their main roads, he is devoting more time to the local county trunks.

The Milwaukee General Construction Company has started grading on the super-highway between Hornburg's and Goerke's Corners. The 3.2 miles will cost $120,000 and is to be completed by November 1. It is expected that the old Blue Mound, now United States Highway No. 16 will be double-tracked from Milwaukee to Goerke's by that date. The central portion will leave room for future widening.

GASOLINE PLYMOUTH LOCOMOTIVES DIESEL

The

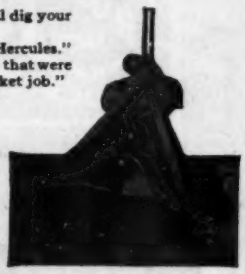
TIME IS THE TEST. IT'S THE SAVING IN OPERATION COST THAT COUNTS.

PLYMOUTH
LINE OF GASOLINE AND DIESEL
LOCOMOTIVES
IS COMPLETE FROM
2 TON TO 50 TON SIZES

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
277 Riggs Avenue PLYMOUTH, OHIO

Don't give up—
try a real digger

If you haven't had a bucket that will dig your material, or *stand up* in the work—
Get a Heavy Duty WILLIAMS "Hercules." This powerful bucket has dug materials that were previously rated "not practical as a bucket job." Write us for our new Bucket Book.



G. H. WILLIAMS COMPANY
603 Haybarger Lane, Erie, Pa.
Branch Offices:
New York Pittsburgh Cleveland Chicago

WILLIAMS
FAST-DIGGING BUCKETS

THE IMPROVED

McCORD POSITIVE SIGHT-FEED LUBRICATOR

Establishes New Standards In Force Feed Lubrication

New standards of production in lubricator manufacture, plus improvements in design and construction embodied in the new McCord "LD" Lubricator, result in a range and accuracy of adjustment not previously obtainable. The oil flow can be regulated from one-tenth of a drop to ten full drops per revolution, while a positive adjustment insures equal distribution.

The McCord "LD" Lubricator starts pumping at the first turn of a wheel. It will not become air bound under any operating condition.

The McCord "LD" Lubricator pumps any grade of oil from the lightest mineral oil to the heaviest grade of cylinder oil. It is particularly adapted to the handling of high viscosity oils.

Drop forgings are used throughout. All parts are machined to close dimensions. Pump units are drop forged brass. Each unit is independent and can be removed for adjustment or inspection for cleaning, without disturbing other units.

Simplicity of operation and accessibility are combined in the McCord "LD" Lubricator, resulting in a lubricator devoid of minor troubles.

A new catalog on McCord Class "LD" Lubricators will be forwarded on request.

The new McCord "Class LD" Positive Sight-Feed Lubricator further establishes McCord leadership in this field. Important improvements, the result of McCord's twenty-eight years lubricator building experience, make the McCord "LD" an outstanding Lubricator for Diesel and oil engine use.

McCORD RADIATOR & MFG. CO.
Lubricator Division — Detroit, Mich.

Electric Shovels—
Servants of Industry

These shovels require no fuel—electricity operates them. Water lines are unnecessary—and there is no "steaming up" to cause delay.

G-E Motorized Power on shovels effects remarkable economies. Reduction in man-hours, in power costs, and in maintenance expense; superior flexibility, higher speed, and greater simplicity of control—these are some of the reasons for the rapidly growing use of electricity for shovel operation.

G-E equipped shovels have an enviable record for performance—that's why G-E equipment is almost invariably specified. Your nearest G-E office is always ready to furnish information and advice.

Motorized Power
—fitted to every need

200-181

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

In writing to General Electric Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Oklahoma Notes

BY F. W. KNABLE

Richards & Moorman, contractors, of Chandler, Oklahoma, have started work on their award located from Chandler to Stroud, Oklahoma, on Highway No. 66.

H. L. Kennedy Company, Tulsa, Oklahoma, are getting along nicely on their paving award located between Chandler and Welston, Oklahoma, State Highway No. 66.

Spencer Brothers, Columbia, Missouri, recently began operations on their crushing plant, located near Mangum, Oklahoma. The plant has a capacity of about twenty-five cars per day.

St. Louis Items

BY A. J. KOENIG

Frank Neher, pioneer railroad builder and former assistant chief engineer for the Missouri Pacific Railroad, died at his home at Washington, Missouri, Tuesday, June 12th, at the age of seventy-one years.

Neher was active as a railroad builder in the Western and Central states. He was with the Illinois Central Railroad for ten years, and later with the Missouri Pacific Railroad. While with the latter road he built the freight terminals at Dupo, Illinois. He was a former St. Louisan and retired in 1918 when he moved to Washington, Missouri.

The Pennsylvania Railroad plan the expenditure of three million dollars for the extension of their double-track and elimination of curves near Adenmoor, Illinois. The stretch three miles long will eliminate two reverse curves. Approximately $1,000,000 will be used for grading.

Here the Track Machine is taking the place of a jack crew, raising the track on a railroad construction job.

Raising Track Without Jacks

This modern labor-saving development with its various attachments is suitable for any track raising, shifting, ballasting or steel re-laying job. Wherever used it has proven to be a great saver in time and labor. Its performance will surprise you.

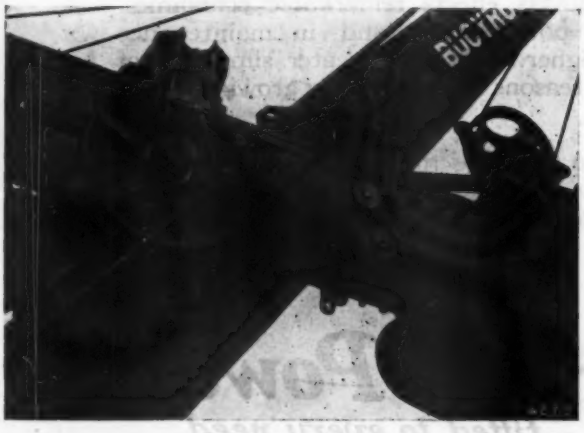
Write for Bulletin GR-8.

NORDBERG MFG. CO., Milwaukee, Wis.

THE NORDBERG PATENTED TRACK MACHINE

NEW 50-B DIPPER TRIP

For Steam or Air



A power Dipper Trip will enable your crew to work to better advantage and to increase the yardage.

We have other designs for Steam and Electric Shovels.

Write for information on a suitable Dipper Trip for your machines.

BUCYRUS-ERIE COMPANY

SPECIALTY DEPARTMENT

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

Bates Tractors

BATES 70

3 Sizes

BATES 28 — Made for 8-foot Graders and equipment of similar capacity.

BATES 40 — Made for 7-yard Crawler Wagons, 10-foot Graders, etc.

BATES 70 — Made for 12-foot Graders and any of the largest tractor tools.

What Bates Customers Say:

"The long crawlers are a great advantage and the tractor is very easy to handle and will turn around squarely. I use it on an Austin Leaning Wheel Rip Snorter Grader which is one of the largest made for contracting, and the tractor has an easy time handling it and it is never crowded by any pull."

— An Indiana Contractor.

"The Bates tractor is a well-built tractor and the Bates people are all right to deal with. I think that the Bates "40" is hard to beat. The long crawlers have a great advantage over the short ones."

— An Iowa Contractor.

Write for New Catalog.

Bates Manufacturing Company
JOLIET, ILL., U. S. A.
Established 1883

Pioneers in the Tractor Industry

Roebling

"Blue Center" Steel Wire Rope

Fabricated in constructions particularly adapted for excavating machinery.

John A. Roebling's Sons Company Trenton, N.J.

SHOTS FROM THE FIRING LINE — Continued

Bids were opened in the $2,850,000 levee construction program for the First and Second River Commission Districts and contracts will be awarded as soon as bids are approved by the Washington officials. The low bidders were as follows: J. L. Ward Construction Co., Cleveland; Fred C. and George Morgan, Indianapolis; C. I. Jones, St. Louis; A. A. Davis, Kansas City; Forcum-Jones, Dyersburg, Tennessee; William W. Roth, Hickman, Kentucky; Chas. C. Aderholdt, Memphis; G. C. Weathers, Jr., Greenville, Mississippi; Pilkington Bros., Artesia, Mississippi; Canal Construction Co., Memphis, and Henry T. Kaiser, Oakland, California. Bids were received from thirty-one contractors. The tentative list of successful bidders was selected by Luther Y. Kerr, senior civilian engineer, and C. E. Huffstetter, assistant engineer. Approximately 6,000,000 cubic yards of levee work is involved, which, when completed will raise all levees in the Memphis district to the 1914 standard, or above.

M. E. Gilliox, Monett, Missouri, has contract for grading 13½ miles of state road in Phelps County, Missouri.

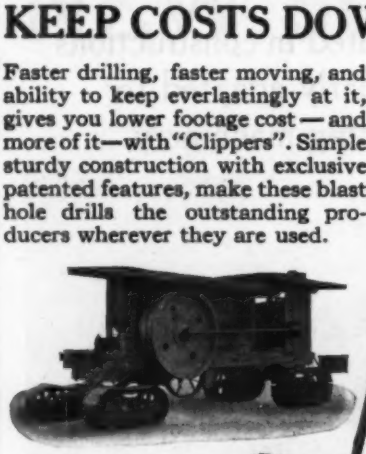
V. E. Koch, Joplin, was awarded the grading contract for 10½ miles of highway in Pettis County, Missouri, on their bid of $86,913.

A contract for a drainage ditch, sixteen miles in length, between Lincoln and Middletown, Illinois, was awarded to Frank M. Crane of Omaha. Two bridges on this work will be built by E. H. Riebe of Lincoln, Illinois. The contract price was $166,871 and $13,066 respectively.

John Marsch, Inc., 1307 Wrightwood Avenue, Chicago, Illinois, offer for rent the following equipment: seventy 12-yard Western air-dump cars, in first-class condition; also three all steel Jordan spreader cars, rebuilt, with all latest improvements and wing extensions.

Loomis "CLIPPER" Drills
KEEP COSTS DOWN

Faster drilling, faster moving, and ability to keep everlastingly at it, gives you lower footage cost — and more of it—with "Clippers". Simple sturdy construction with exclusive patented features, make these blast hole drills the outstanding producers wherever they are used.



Ask our customers about "CLIPPER" Blast Hole Drills. They will tell you how "CLIPPERS" keep costs down.

THE LOOMIS MACHINE CO.
(Established 1842) K Street, Tiffin, Ohio

Asbestos

Brake Blocks

Our Asbestos Blocks formed under hydraulic pressure will outlast other braking materials and are the most economical lining we know of for Brake Bands, Frictions and Clutches.

We will write you fully on this subject if you will supply your machine number.

BUCYRUS-ERIE COMPANY
SPECIALTY DEPARTMENT
SOUTH MILWAUKEE, WIS., U. S. A.

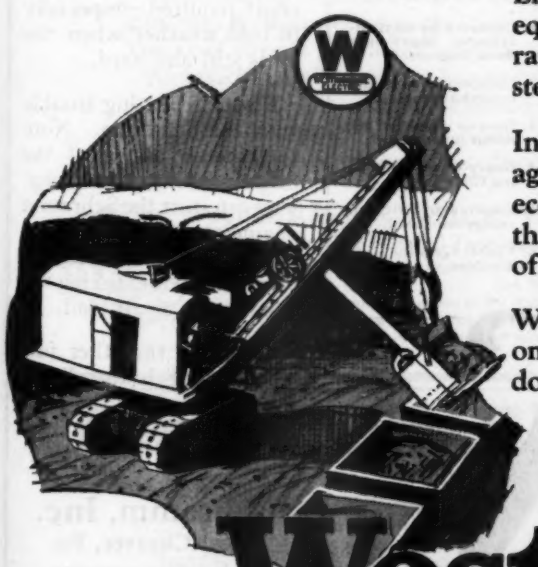
faster digging—

—bigger profits!

MORE bites per working day mean greater income from your shovel equipment. Electric shovels, powered with Westinghouse equipment, have all the flexibility and speed range of steam with no time lost waiting for steam pressure.

In addition to this, Westinghouse variable voltage equipment for power shovels affords greater economy in operation—there's no fuel to handle; there's no fireman required; there's no problem of feed water supply.

With all the advantages of steam plus the economy of electricity, the electric shovel certainly does dig!



Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

Variable Voltage Equipment *for* Electric Power Shovels

In writing to Westinghouse Electric & Mfg. Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Denison-Brown Construction Co. of Cushman, Arkansas, has begun work on repairs and extension of the Newport levee. The company was awarded the contract at a price of $14,461. Denison-Brown built the original Newport levee which was the only levee on the White River that held against the flood last year.

Chas. Mulvill, Alton, Illinois, has about a mile of light grading on new railroad construction, suitable for machine outfit, that he would like to sublet.

Perry T. Fess, Madison, Wisconsin, has an outfit at work on Sections 102 and 103, Route 152, Perry County, Illinois, where they are laying twelve miles of slab.

Davis Construction Co. have about 400,000 yards of highway grading near Pocahontas, Arkansas, that they would like to sublet. Any one interested can reach them at Pocahontas, Arkansas.

Kansas Notes

BY F. W. KNABLE

Best Brothers, Keen's Cement Company, Medicine Lodge, Kansas, has awarded a contract to the Stevens Engineering and Construction Company, of St. Louis, Missouri, for a new manufacturing unit.

A. A. Davis & Company, Kansas City, Missouri, have started work on their award located near Neosho County, Kansas.

Solvay Process Company began operations on their quarry located at Moline, Kansas, some time ago. Mr. H. A. Pierce is manager.

Koppel Cars *last years longer*

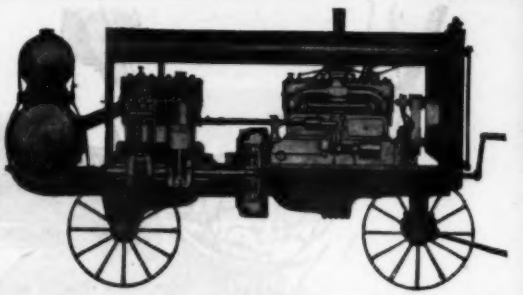
Because they are built of the longest-lasting, highest grade materials—because they are designed with extra margins of strength in every detail and because of careful conscientious workmanship, Koppel Cars are recognized everywhere as the best car equipment money can buy.

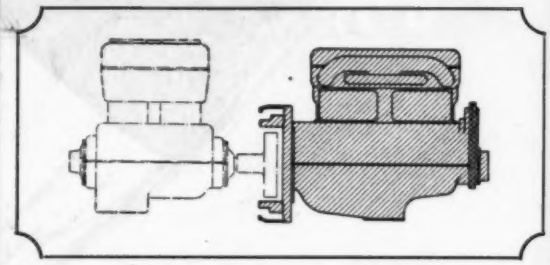
Send for descriptive catalogue.

KOPPEL

KOPPEL INDUSTRIAL CAR AND EQUIPMENT CO.
KOPPEL, PA.

Chicago New York
Pittsburgh San Francisco





Engine starts without compressor load!

Why "SCHRAMM" Is Preferred

1. Operated by vertical-cylinder heavy-duty Buda Engines.
2. Compressor parts are interchangeable.
3. Greater capacity per dollar invested.
4. Heavy-duty self-aligning Clutch.
5. Engine starts without compressor load.
6. Visible Gasoline Strainer.

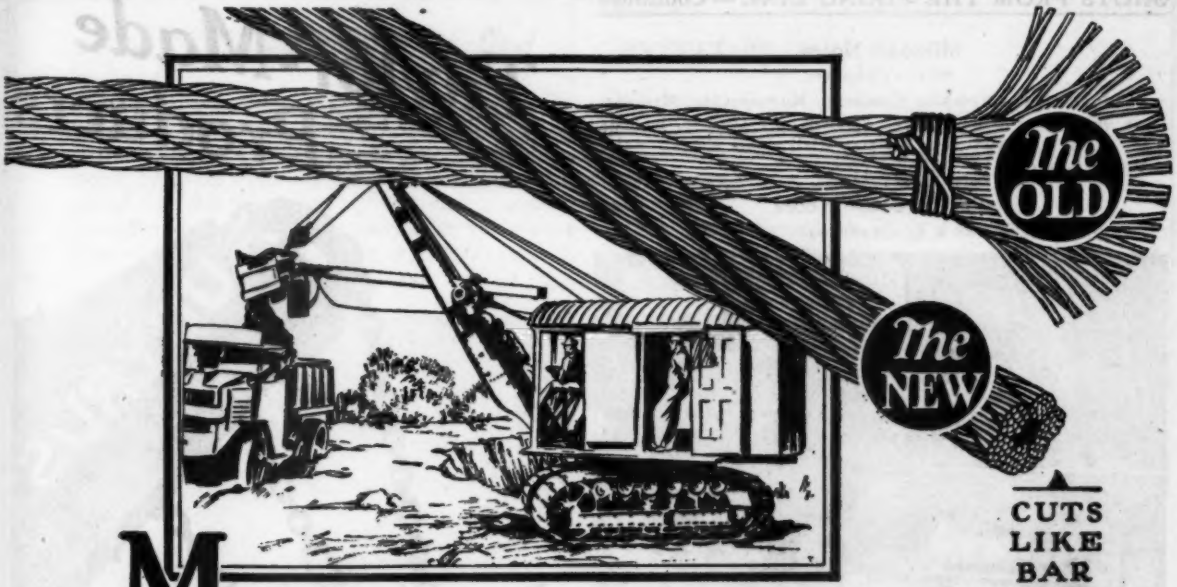
When you crank the ordinary Portable Compressor engine with the solid coupling, both engine and compressor must be turned over in starting. Think of the effort required—especially in cold weather when the oil is stiff and hard.

No such starting trouble with the Schramm. Note the sketch above of the Schramm Clutch coupling. You can start the Schramm engine separately, and get it warmed up for full load operation before taking the compressor or air load.

Look over the other features of the Schramm listed here and send for the 1928 Schramm Catalog.

Schramm, Inc.
West Chester, Pa.
Offices and representatives in all important cities.

Schramm



CUTS LIKE BAR

Make your WIRE ROPE *dollars go further!*

TRU-LAY PREFORMED WIRE ROPE costs less because it lasts longer in service. That's why so many cable users prefer this improved rope.

Its preformed construction gives TRU-LAY added life and makes it the ideal rope for the heaviest work. Every wire is *laid* in place—not *twisted*. Torsional stresses are eliminated—all of the wires are utilized.

And TRU-LAY is easier to handle because it cuts like bar. No seizing is required—there is no wastage from frayed ends.

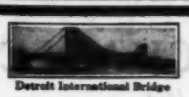
Know the facts about TRU-LAY. Your name and address bring a sample. Then make your own convincing test.

AMERICAN CABLE COMPANY, *Incorporated*
Grand Central Terminal Building, New York, N. Y.
District Offices: Chicago, Detroit, Philadelphia, Pittsburgh, Tulsa, San Francisco
An Associate Company of the American Chain Company, *Incorporated*
Dominion Wire Rope Company, *Limited*, Montreal,
Sole Canadian Licensed Manufacturers

PREFORMED WIRE ROPE

TRADE TRU-LAY MARK

(Reg. U. S. Pat. Off.)


Detroit International Bridge

Philadelphia-Camden Bridge, The World's Greatest Suspension Bridge

Mt. Hope Bridge, Bristol, R. I.

A merican Cable is used on the World's Greatest Bridges

In writing to American Cable Company, Inc., please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Missouri Notes

BY F. W. KNABLE

W. C. Hill Construction Company, Kansas City, Missouri, have opened up a new quarry located near Ottawa, Kansas. They recently moved their Bucyrus 31-B steam shovel to this point to take care of stripping operations.

Pacific Coast Notes

BY T. L. CULBERTSON

Much has been published about the St. Francis Dam disaster. Here we have a picture of some of the Caterpillar-drawn fresnos piling up silt to be loaded by clamshell on

Hayward Drag-line Buckets — *for powerful digging* — *for steady carrying* — *for easy discharging*

WATCH a Hayward Drag-line Bucket at work. Note the crowding action. Note how it fills quickly within its own length. Watch it carry a full load at the proper angle to the dumping point — then quickly and easily discharge.

Bulletin 666-A gives complete information regarding this bucket. May we send it to you?

THE HAYWARD COMPANY
52-54 Church Street New York, N. Y.

Hayward Buckets

Taylor-Made Products

Besides the Famous

TAYLOR MESABA

STEAM SHOVEL CHAIN

Taylor-Made Products Include

Electric Weld—Fire Weld—Hand Weld

Proof Coil Chain	Sling and Crane Chain
B. B. Coil Chain	Log or Binding Chain
B. B. B. Coil Chain	Derrick Chain
Twist Link Coil Chain	Railroad Switch Chain
Steel Loading Chain	Railroad Brake Chain
Stud Link Anchor Chain	Log Haul-Up Chain
Close Link Anchor Chain	Wagon and Stay Chain
Conveyor Chain	Dredge Chain
Grab-Slip Hooks	Chain and Ring Dogs
Cold Shuts	Open Links
Missing Links	Special Hooks
Anti-Skid Chain for Trucks	Shackles or Clevises
Bright Machine Chain	Bright Liberty Coil Chain
Tow Chain	Mine Car Hitchings or Couplings
Pocket Wheel Chain	
Sheave Chain	Boom and Rafting Chain

Special Chains to Blue Print

SAVE MONEY BY USING TAYLOR CHAINS
"BEST BY TEST"

S. G. TAYLOR CHAIN CO.
Established 1873
HAMMOND INDIANA

"Entirely satisfied . . . expect to add more"

"During the past five or six years we have purchased a number of Kohler Electric Plants for installation on our dragline machines. From reports received from our field foremen we understand that this equipment is giving entire satisfaction; better, we believe, than any other equipment that we have used for lighting purposes in the past.

"We are entirely satisfied with the performance of these lighting plants and expect, in the future, to add several more of the same to our present equipment." McWILLIAMS DREDGING COMPANY
Drainage Contractors
(Signed) W. H. McDonough, Treas.
Chicago, June 25, 1928

Dredge operated by McWilliams Dredging Co., Chicago equipped with Kohler Electric Plant for night work

Earn bonuses—save penalties

Kohler Electricity will help you

WHEN a stretch of bad weather takes a deep cut out of your working hours, you can make up for lost time by pushing your equipment twenty-four hours a day—with a Kohler Electric Plant brilliantly floodlighting the job.

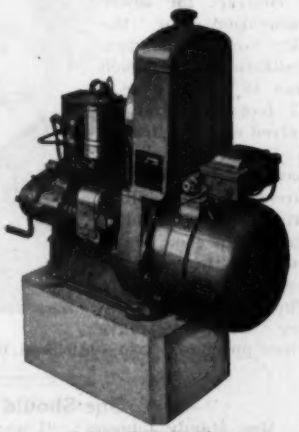
There is a 1½-K.W. Kohler plant that is *made* for work like this. A big-capacity plant, capable of supplying powerful 110-volt current for lighting six 250-watt projectors at once. A rugged plant, built to "stand the racket." A compact plant—only 34¾ inches high, 35 inches long, and 16½ inches wide—easy to mount on your equipment.

Many contractors are using this plant, the Model E illustrated opposite, on dredges, draglines, excavators, pavers, etc. They are getting *dependable* current, always at full voltage, and their cost sheets show that upkeep and operating costs are remarkably low.

Investigate this sturdy, efficient, smooth-running 4-cylinder outfit. It has made a great record for itself in work exactly like yours.

Kohler Co., *Founded 1873*, Kohler, Wis. · *Shipping Point*, Sheboygan, Wis.

Branches in Principal Cities



Kohler Electric Plant
Model E, 1½ K. W.—110 Volt D. C.
Other models, 800 Watts, 2, 5 and 10 K.W.

Write for our booklet giving complete information. Ask for prices.

KOHLER OF KOHLER
Electric Plants
Automatic—110 Volt D. C.—No Storage Batteries

In writing to Kohler Company please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

Ford trucks. The other picture shows Mr. Wells and Mr. Bressler, engineers in charge of the A. G. C. job of rehabilitation, involving millions of dollars and employing some 2000 men.

Contract was awarded to Western Dredging Company, Security Title Insurance Building, Los Angeles, who bid $475,000 for dredging channels in San Diego Bay at Municipal Airport. The next lowest bid was United Dredging Company, Los Angeles, $547,500. The work involves 2,600,000 cubic yards of dredging.

The Old Mission Portland Cement Company of San Juan, California, is building a three-mile extension to its quarry railroad. This work includes a tunnel 340 feet long, three trestles over canyons, one of them 100 feet high, and the moving of 140,000 cubic yards of material.

Contract was awarded to Dutton Dredging Company, Mills Building, San Francisco, for 525,000 cubic yards hydraulic fill for Benecia Reclamation District. Mr. F. A. Steiger, Fairfield, California, is engineer.

Plans and specifications are completed by Consulting Engineer M. M. O'Shaughnessy, City Hall, San Francisco, and approved by Board of Supervisors of the City and County of San Francisco, bids to be called in a month or so, with reference to the reclamation of 280 acres of land for the Islais Creek Reclamation District. The work involves 6,074,802 cubic yards dredging fill at 15c a yard, $911,220; 2,090 lineal feet rock bulkhead at $236.90 a foot, $493,867; 3,500 lineal feet sewer, $160,000. The total estimated cost of the project is $1,620,152.

Contracts were officially awarded as follows by the Bureau of Public Roads, Washington, District of Columbia, for work in Lassen Volcanic Park, Lassen County, as follows: (a) To Arthur Jones, Montague, who bid $48,838 for grading 2.72 miles of western portions, Section C, Route 1, engineer's estimate $71,279; (b) To T. E. Connolly, Sheldon Building, San Francisco, $62,542, for surfacing 9.15 miles northern portion of Route 1, engineer's estimate $69,737.

The California Trenching Company of Los Angeles, California, recently handled a contract for sewer excavation for the City of Alhambra, California. The trench was 18 inches wide x 17 feet deep and involved cutting through 5 inches of asphalt paving. The Barber-Greene Ditcher, illustrated above, handled the job in good shape, cutting through the asphalt in good order. The California Trenching Company have since purchased two additional Barber-Greene Ditchers.

She Should Worry

Mrs. Mandy Johnson: "I wants to see Mistah Roeser."

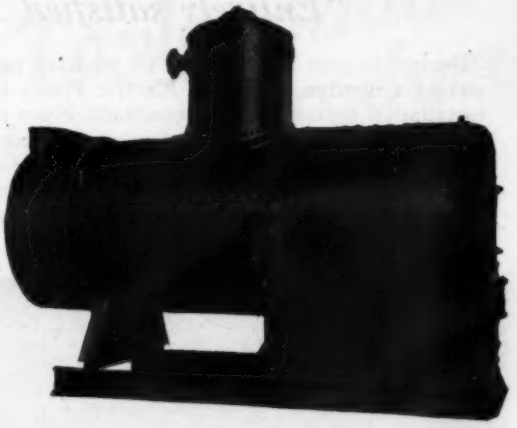
Office Boy: "Mr. Roeser is engaged."

Mrs. Mandy Johnson: "Go long boy. Ah don't want to marry him. Tell him his washlady wants huh money."

Your Nose Knows

Izzy: "Did you know that Cohen has vent into de fur bizness. He has started a skunk farm."

Ikey: "Yes, I got vind of it yesterday."



EXACTLY RIGHT

for your particular machine

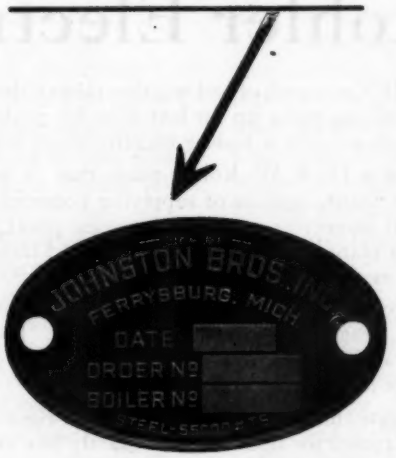
PRESSURE ENOUGH to speed her up and handle the hardest digging.

CAPACITY ENOUGH for all demands and at reasonable fuel cost.

SUBSTANTIAL ENOUGH to stand up to your kind of work, year after year, without breakdowns.

Nothing less than the highest quality can be **EXACTLY RIGHT.**

DO YOU LOOK FOR



JOHNSTON BROS., Inc.

Specializing in Boilers for Contractors' Equipment

FERRYSBURG, MICHIGAN

BOOK REVIEWS

We shall be glad to review such books and catalogs as are sent us

"LUBRICATION FOR SAFETY AND ECONOMY" is the name of a new 20-page booklet just published by *E. F. Houghton & Company, Philadelphia, Pennsylvania.* It relates to Houghton's Absorbed Oils and the Gun-Fil Lubricator. It explains in detail why a proper oil feed is essential to greatest economy in lubrication.

The Silent Hoist Winch & Crane Company, Brooklyn, New York, have just issued Bulletin No. 27, featuring all the different types of SILENT HOIST Vertical and Horizontal Capstan Winches, and Single and Double Drum Winches, self-contained units complete with electric motor and gasoline drive. These winches are suitable for either portable or stationary use, as car pullers, barge movers, and for general pulling and hoisting, in and about industrial plants, and for docks, wharves and ships. The above company will be glad to send the bulletin to anyone interested on request.

Some Fish Grow Fast

Tommy: "Do fish grow very fast?"

Billy: "I should say. Father caught one once and it grows six inches every time he mentions it."

The Difference

"Papa, what is a low-brow?"

"A low-brow, my son, is a person who likes funny papers, snappy stories, girl shows, and the like and doesn't mind saying so."

"And what's a high-brow, papa?"

"A high-brow, my son, is a low-brow who won't admit it."

GREDAG
REG. U.S. PAT. OFF.
LUBRICANTS

THE STANDARD FOR

POWER SHOVELS AND ALL OUTDOOR MACHINERY

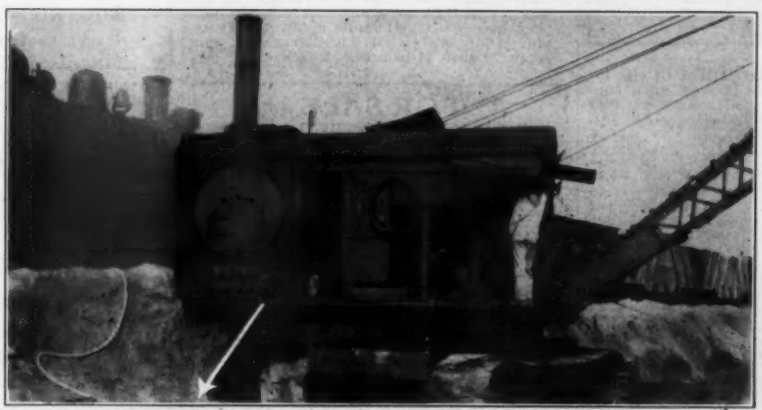
WATERPROOF, DURABLE AND WEAR RESISTANT

Used and recommended by leading manufacturers of excavating and material handling machinery

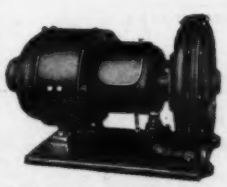
MADE BY

ACHESON GRAPHITE CORPORATION
NIAGARA FALLS, NEW YORK

"... has given us good satisfaction"



Showing the Moon Type 4 Turbo Generator installed on a dragline in the gravel pit of the Memphis Stone & Gravel Co., at Atmore, Alabama.



Moon Turbo Generators
Capacities: 1, 1½, 3 and 4 KW.

"THE Moon Steam Turbine Generator installed on the 50-B dragline has given us good satisfaction and we have experienced no trouble with it" writes W. H. McDonald, Gen. Mgr. of the Memphis Stone & Gravel Co.

Satisfaction in a lighting plant means steady, dependable performance, night after night, with a minimum of maintenance. Moon Generators have proven this during their 15 years of faithful service in the construction field.

Write for our new Bulletin E-1 showing the entire Moon line.

The Moon Manufacturing Company
108-128 N. Jefferson Street CHICAGO

Meeting Place of Capital and Labor

The **KOENIG LABOR AGENCIES**
Established 1875

ST. LOUIS
612 Walnut Street
Main 2766 and 2767

KANSAS CITY
501 Delaware Street
Main 0796

Help of All Kinds Furnished Free

Black Gum Rollers

Standard dragline sound heart black gum rollers recommended by all contractors as superior to maple, at one-third the cost. Send us a trial order for a set, and be convinced. Used exclusively in all southern levee building on soft soil, which is a hard test on rollers. They have proven superior to all other materials.

Doherty-Walsh Roller Co.
Baton Rouge, Louisiana

FOR SALE

Space under this heading is available at the following rates:

1 to 3 inches.....$4.30 an inch
4 to 7 inches..... 4.10 an inch
8 to 14 inches..... 4.00 an inch

An inch is measured vertically on one column — three columns to a page. Any space may be used measured by the even inch in height and by one, two or three columns in width.

The price per inch is based on total space used — multiply ad space by number of continuous insertions.

Wanted Quick!

SIX 12 to 15-ton Gas Locomotives, 36-inch gauge.

52 4 or 5-yard Dump Cars, 36-inch gauge.

Must be in good used condition and worth the money.

Address Box 808, The Excavating Engineer, South Milwaukee, Wisconsin.

CLASS-14 OIL-ELECTRIC DRAGLINE, located Florida. Machine in very good condition and priced to sell. Address Box 806, The Excavating Engineer, South Milwaukee, Wisconsin.

MODEL 103-C BUCYRUS STEAM SHOVEL, Shop No. 3864. Purchased new from manufacturers, March 1923. 3½-cubic-yard manganese steel dipper, 30-foot 3-inch boom, 19-foot 6-inch dipper handle, 1½-inch Cross Compound Westinghouse Steam Air Compressor with receiver, 1½ K.W. Moon Turbo-Generator electric lighting plant, caterpillar mounting.

MODEL 88-C BUCYRUS STEAM SHOVEL, Shop No. 3792, purchased new from manufacturer March 1923, 3-cubic-yard manganese steel dipper, 30-foot dipper handle, 10½-inch Cross Compound Westinghouse Steam Air Compressor, 1½ K.W. Turbo-Generator electric lighting plant, caterpillar mounting.

Both machines have been completely torn down and overhauled, with new cabs, and cannot be told from new. Located in Chicago. Address Box 801, The Excavating Engineer, South Milwaukee, Wisconsin.

O & S SHOVEL, 1-yard. Full Crawler, full-revolving, thoroughly overhauled.
INDUSTRIAL LOCOMOTIVE CRANE, 15-ton, 8-wheel MCB, thoroughly overhauled.
THEW "00" GAS SHOVEL, on crawlers, 2 years old and fine.
Prices very low.
"ZELNICKER" in St. Louis
Rails, Equipment, Hoists, Steel Piling, Etc.

ORTON STEAM CRANE mounted on caterpillar trucks, 50-foot boom, oil burner, in first-class condition. Address Box 800, The Excavating Engineer, South Milwaukee, Wisconsin.

LORAIN "75," about 2 years old, equipped with 1¼-yard shovel combination and 45-foot boom, 1-yard dragline attachment. Ready for immediate delivery. Located near Omaha. Address Box 802, The Excavating Engineer, South Milwaukee, Wis.

CLASS-14 STEAM DRAGLINE on skids and rollers. Equipped with 60-foot boom, 2-cubic-yard class "S" Page bucket, shop No. about 3400. Machine in excellent condition and has only worked during summer months, handling sand and gravel. Boiler was refued last year and machine has not been used since. Machine about five years old. Address Box 804, The Excavating Engineer, South Milwaukee, Wisconsin.

FOR SALE

BUCYRUS 14-B REVOLVING-TYPE STEAM SHOVEL, ¾ cubic yard, on Traction Wheels. Now at Bayonne, New Jersey. Write for particulars. Address

G. D. HISCOX
100 William Street New York, N. Y.

Factory Rebuilt Pumps In Our Chicago Stock

1 — 10 x 8, Double Suction, 2000 G.P.M., $400.00.
1 — 6 x 6, Double Suction, 1200 G.P.M., $270.00.
1 — 4 x 4, Double Suction, 300 G.P.M., with motor, $190.00.
1 — 4 x 4, Double Suction, 600 G.P.M., with motor, $410.00.
2 — 3 x 3 Caisson Pumps, 300 G.P.M., direct current motors, $380.00.
6 — 2 x 2 Double Suction, 120 G.P.M., with motors, $150.00.
2 — 2½ Single Suction Pumps, $45.00.

Wire orders collect as list is subject to prior sale. Complete list on application covers all makes and types of pumps.

Economy Pumping Machinery Co.
3431 West 48th Place, Chicago, Ill.
Phone Lafayette 7325

FACTORY REBUILT BUCYRUS-ERIE Shovels

High Lift 'B' ERIE Steam Shovel with power operated boom hoist and brand new caterpillar-type mounting.

High Lift Gas & Air ERIE Shovel on caterpillar-type mounting.

Type A Erie Steam Shovel, ⅝-yard dipper, 16-foot boom and 13-foot dipper handle. Caterpillar mounting.

Completely rebuilt. Carry same guarantee as new machines. Immediate shipment.

Write or wire for prices and full information.

BUCYRUS-ERIE COMPANY
Erie, Pa.

ERIE "B" COMBINATION SHOVEL AND CRANE, traction wheel mounted, ⅝-cubic-yard clam bucket, 40-foot boom. Shop number about 1050. Good condition, ready to work. Priced right. Located in Southern Wisconsin. Address Box 504, Excavating Engineer, South Milwaukee, Wisconsin.

TYPE "O" THEW GAS SHOVEL, caterpillar mounted, ¾-cubic-yard dipper, 19-foot 6-inch boom, 18-foot 6-inch dipper stick, Waukesha motor; about three years old; in good condition, just overhauled; located near Milwaukee. Shop number about 2500. Priced for quick sale. Address Box 502, Excavating Engineer, South Milwaukee, Wisconsin.

FOR SALE

MARION 36 STEAMER, 2-yard caterpillar-mounted shovel, together with $3000 worth of repair parts. Machine priced very low for immediate delivery. Located in the Northwest. Address Box 702, Excavating Engineer, South Milwaukee, Wisconsin.

OSGOOD STEAM SHOVEL, ¾ yard, equipped with 21-foot boom, 17-foot dipper stick, ¾-cubic-yard dipper. Shop number about 1300. Purchased new in 1924. New caterpillars put under shovel last year. Has been operated by owner. Address Box 601, The Excavating Engineer, South Milwaukee, Wisconsin.

MARION 26 STEAM SHOVEL, shop number about 2940. Equipped with 32-foot boom, 21-foot handle, mounted on 5-foot traction wheels. Can be inspected at Pittsburgh, Pennsylvania. Machine in excellent condition, ready for immediate delivery. Address Box 600, Excavating Engineer, South Milwaukee, Wisconsin.